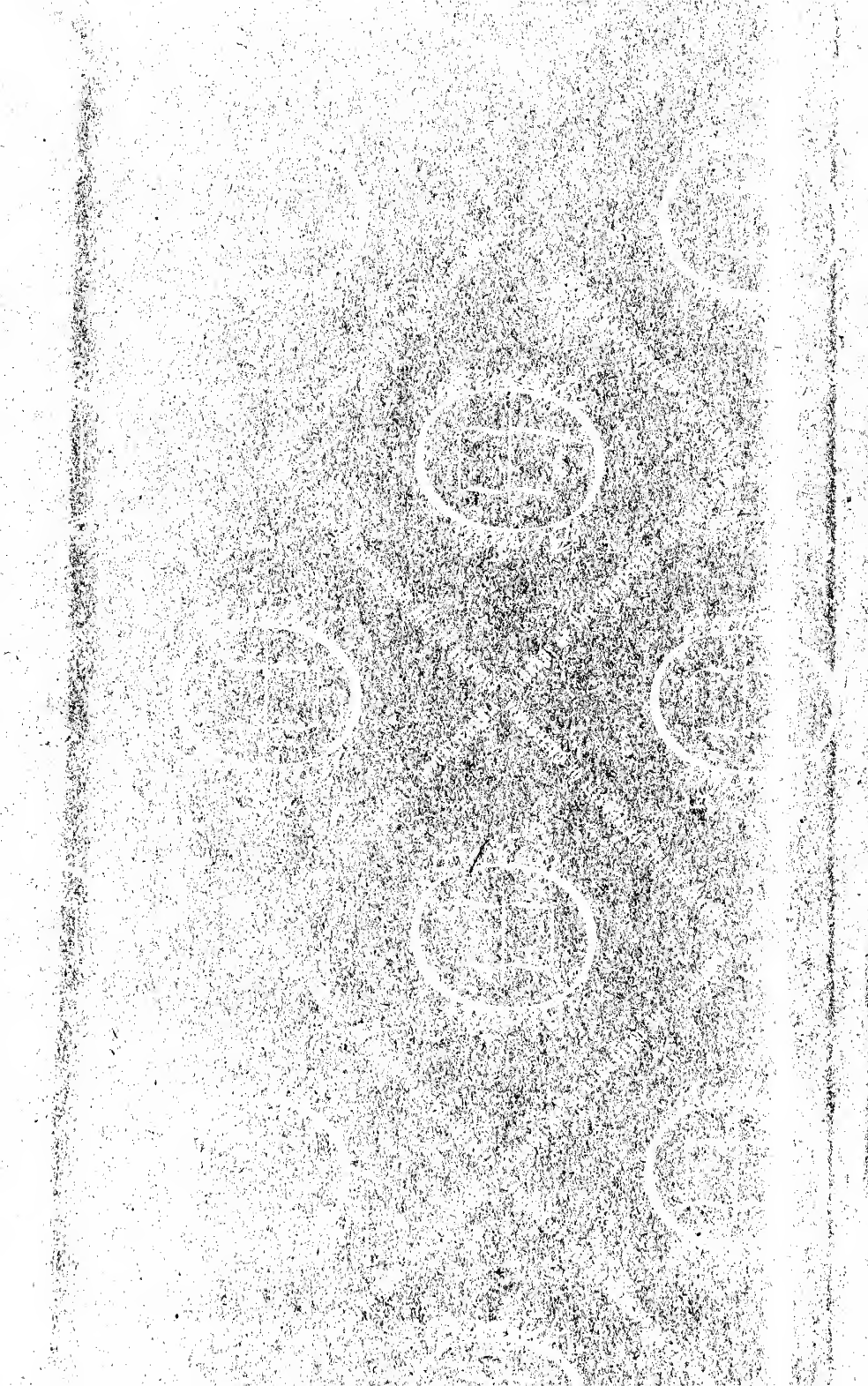
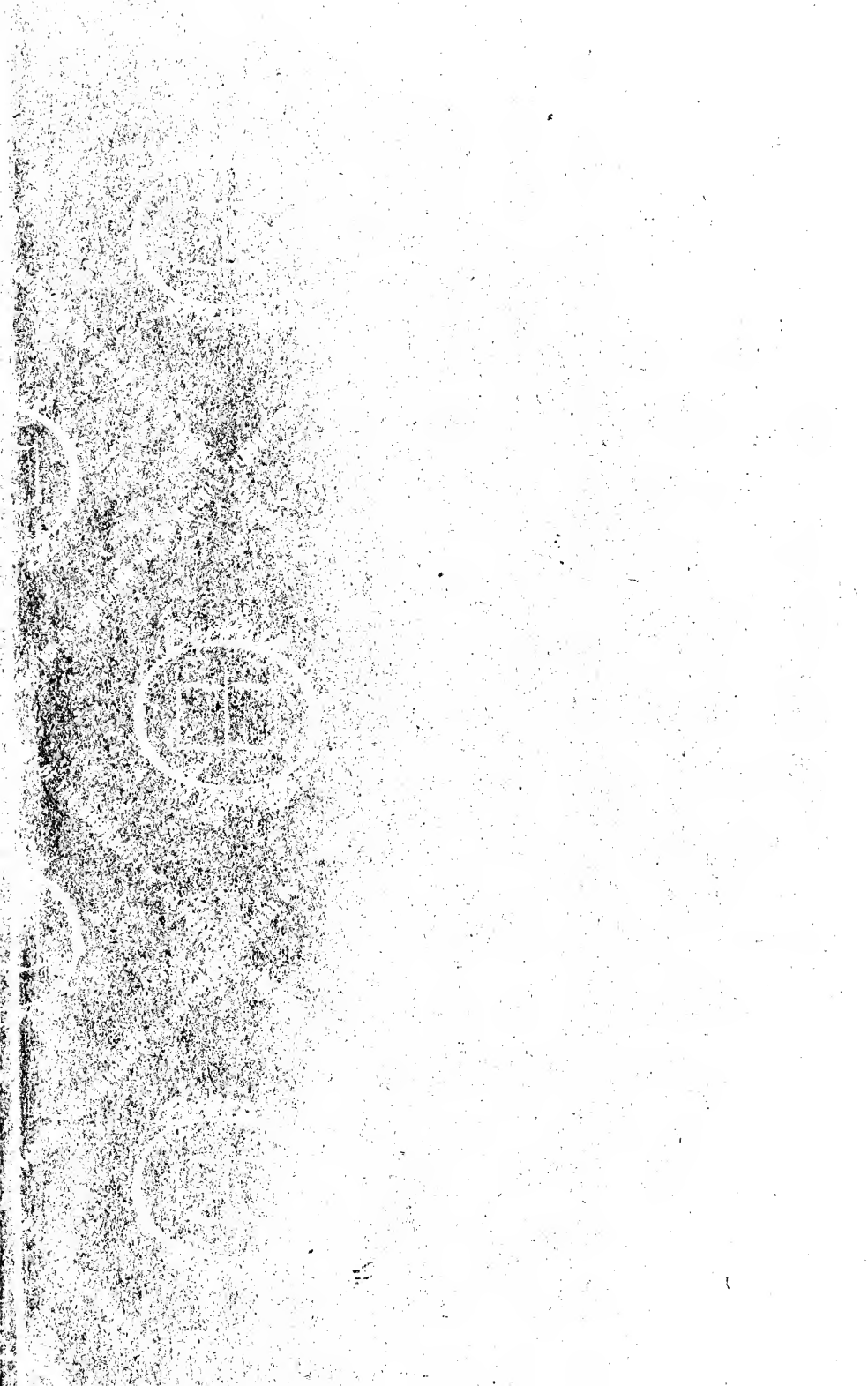


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THE UNIVERSITY OF MISSOURI BULLETIN

EDUCATION SERIES #7

VOLUME 2 NUMBER 1

CIRCULAR OF INFORMATION TO ACCREDITED SCHOOLS

ISSUED BY THE COMMITTEE ON ACCREDITED SCHOOLS



SIXTH EDITION, REVISED

UNIVERSITY OF MISSOURI
COLUMBIA, MISSOURI
October, 1913

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INTRODUCTORY

Organization is the order of the day. In education, as in manufacturing and commerce, it is indispensable to the greatest efficiency. To prevent wasted energy and discouragements which turn many young people from the pathway of their highest development, demands a closer co-operation of the educational forces of the State. This truth is now generally recognized; and, as a result, the efficiency of education in Missouri has been rapidly increasing. County supervision and articulation of elementary and high schools are phases of a general movement which includes also the affiliation of high schools and University, so that there may be a pathway direct from the primary school of any community to the highest educational opportunities offered by the State. For the same reason that high schools must take the initiative in solving the problem of articulating elementary and secondary schools, the University must take the initiative in solving the problem of affiliating high schools and University. Accordingly, in view of a growing demand for organization, the University presents a plan, modified by several years of careful direct study of the school situation, whereby graduates of secondary schools may be admitted to the University without entrance examinations.

This plan necessarily includes a definition of conditions for accrediting. In determining these conditions, it has been the policy of the University to consider in the broadest sense the welfare of high schools. Due recognition has been made of the facts that most graduates of secondary schools do not attend institutions of higher learning, that local conditions vary, and that many schools meet with most discouraging difficulties. It is desirable that high schools have the greatest possible freedom consistent with the purpose of affiliation, and it is the intention of the University to co-operate with them rather than arbitrarily to impose conditions upon them. Accordingly, criticisms of the plan here offered are invited. The administration of this plan requires the examination of each school by an educational expert, whose advice may be taken advantage of by local authorities who wish to improve their schools. This method of affiliation has been justified by the rapid development of many Missouri schools under its influence. As mutual understanding, confidence and co-operation more widely increase, even greater progress is promised for the future.

This circular is prepared for the information of superintendents, principals, teachers and members of school boards who wish to co-operate with the University in this movement. It contains a statement

of conditions for the accrediting of secondary schools, outlines of approved subjects and suggestions for the equipment of laboratories and libraries.

Although there is a distinction between conditions for the accrediting of schools and conditions for admission to the University, some brief information with regard to the latter may appropriately be given in this introductory statement. (a) Graduates of an Accredited School who bring proper credentials of the fact that they have completed the subjects required for entrance to the college which they desire to enter, will be admitted to the University without examination. For these requirements see table in annual catalogue. The student graduating with the highest honors from any Accredited School will be awarded a Curator's scholarship, entitling him to be admitted free of library, hospital and incidental fees for the first year. (b) The diploma will not be accepted as a credential. The student must present the proper form of certificate signed by the principal or superintendent of the Accredited School. Blank certificates will be furnished by the Dean of the University Faculty upon application. The University recommends that Accredited Schools do not issue such certificates to any students except those that have graduated. A certificate of graduation will not be accepted for full value in lieu of entrance examinations, unless the high school course of the pupil has been four years in length and all of the work has been done in the regular sessions of the school. This certificate should be filled out and sent to the Dean of the University Faculty, as soon as possible after the student's graduation. It is desirable that the certificate be sent in advance in order that possible errors may be detected and the student notified accordingly.

Copies of this circular may be secured through the office of the Secretary of the Committee on Accredited Schools, University of Missouri, Columbia, Missouri.

CONDITIONS FOR THE ACCREDITING OF SECONDARY SCHOOLS

A school desiring to be placed on the accredited list of the University should present, as early in the school year as possible, an application to be accredited, blank forms of which will be furnished, upon request, by the Secretary of the Committee on Accredited Schools. After the application has been received, the school will be placed on the visiting list and in due time will be inspected by the High School Visitor. No school will be accredited until the report of the Visitor has been passed upon by the University Committee on Accredited Schools.

In order to be fully accredited by the University, a school must meet the following *minimum* requirements:

1. The course of study must be four years long; and the school term, nine months.

2. There must be at least three teachers in the school, one of whom may be superintendent, but the other two must give their entire time to high school work.

No teacher should have daily more than the equivalent of six single periods of teaching as hereinafter defined, (a less number would be preferable), and, where any teacher has more than this number, the presumption is against the efficiency of the work.

It is strongly recommended that in the selection of teachers, graduates of universities and colleges of recognized standing, or teachers who have had equivalent training, be preferred. With the large increase in teachers having college training, and with the excellent opportunities now offered by the summer schools, the University cannot afford to accredit any school, seeking affiliation, that shows an indifference to the grade of scholarship of the teachers employed.

3. There must be at least one laboratory of science, sufficiently large and well equipped to permit easily of individual work on the part of the pupils.

4. There must be good equipment for the teaching of History and English. This means that the school must have an adequate reference library and a sufficient supply of historical maps.

5. Not less than fifteen units as hereinafter defined must be required for graduation.

Normally no pupil should be permitted to carry more than four subjects at any one time.

6. The school must give satisfactory instruction in subjects as specified below.

By a "unit" is meant a year's work in a subject, with five periods a week. Three periods a week for two years will be accepted as the equivalent of a unit. By a "period" is meant not less than forty minutes of time devoted to actual teaching or eighty minutes devoted to laboratory work.

In the case of the sciences and of Household Arts and Agriculture, at least two of the five periods must consist of eighty minutes each devoted to laboratory work. In the case of Drawing, Manual Training and Bookkeeping, each of the five periods must consist of eighty minutes. In the case of Music, forty minutes counts as a half period, so that five forty-minute periods a week for two years is the equivalent of a unit.

The specifications with regard to subjects in which instruction must be given are as follows:

English	3 units.
Mathematics	2 units.
History	2 units.
Foreign Language	2 units.

These two units must be in *one* foreign language, which may be Latin, Greek, French, German or Spanish.

Science	2 units.
---------------	----------

The two units in science may be in General Biology, Zoology, Botany, Physiology, (provided that the Physiology is preceded by a year's study of Biology), Chemistry, Physics or Physical Geography; or one unit may be in any one of these sciences and the other in either Agriculture or Household Arts.

Elective Subjects	4 units.
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These four units, which are to be given in addition to the ones specified above, must be selected from the subjects named in the following list, in which the maximum and minimum number of units accepted in each are indicated:

Subjects	Maxi- mum	Mini- mum
English	4	3
Algebra (elementary)	1½	1
Plane Geometry	1	1
Solid Geometry	½	½
Trigonometry	½	½
‡Arithmetic (advanced)	½	½
‡Algebra (advanced)	½	½
History	4	2

(Continued on page 9)

‡The courses in advanced Arithmetic and advanced Algebra are not approved, if they are not preceded by those in elementary Algebra and Plane Geometry.

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Subjects (Continued)	Maxi- mum	Mini- mum
American Government (Civil Government)....	$\frac{1}{2}$	$\frac{1}{2}$
Latin	4	2
Greek	3	2
German	3	2
French	3	2
Spanish	3	2
Physics	2	1
Chemistry	2	1
General Biology	1	1
Botany	2	1
Zoology	2	1
†Physiology	1	1
Physical Geography	1	1
Agriculture	1	1
Music	1	1
Drawing	2	1
Manual Training	2	1
Household Arts (Domestic Science and Art)...	2	1
Economics	$\frac{1}{2}$	$\frac{1}{2}$
Commercial Geograph... ..	$\frac{1}{2}$	$\frac{1}{2}$
Bookkeeping	1	$\frac{1}{2}$
Teacher-Training Courses	2	$\frac{1}{2}$

†In cases where the study of Physiology has been preceded by a year's study of Biology.

7. When instruction in subjects named in the above table is given in excess of the minimum requirement, it must, in every case, be efficient.

Secondary schools which maintain a four years' course of study, but do not fulfill all the requirements for a fully accredited school, may be *partially accredited*.

The University reserves the right to cease to accredit, at any time, a school that employs inefficient teachers or that otherwise fails to maintain the required standard.

I

OUTLINE OF APPROVED SUBJECTS

ENGLISH

FOUR UNITS MAY BE OFFERED

Literature. It is recommended that one-half of the time allotted to English be given to the study of literature, by which is meant not the study of a manual on the history of literature, but literature itself in the selected works of representative authors. Masterpieces as a whole, suited to the attainments of the class, should be read in class and carefully examined, while other works may be assigned as collateral readings, of which reports, written or oral, should be required. In the fourth or last year, in connection with a wider range of reading in literature, a brief history of the literature may conveniently be used.

English Grammar. Everywhere pupils enter the high school with an inadequate knowledge of English grammar. The systematic study of grammar, therefore, as the foundation of higher scholarship in English, should be pursued in the high school. An accurate knowledge of grammar and of grammatical analysis is often indispensable to the right interpretation of literature and to confident correctness in composition. Without strict grammatical training the pupil finds himself at a disadvantage in trying to grasp the meaning of an involved sentence as well as in the attempt to express without ambiguity his own thoughts.

The method of teaching grammar should almost invariably be inductive. By making use of the pupil's own words and sentences, his reading, and his composition, one can easily establish the simpler definitions, rules, and principles of grammar. As each point is made, it will be well to refer to a text-book by way of confirmation of what has been found. Following upon this, drill exercises, drawn from the text-book, could be used to advantage. The study of grammar should never become merely formal. All definitions, classifications, and rules should be seen to grow out of, and ever refer back to, words and sentences. The object of the work is not that one may be able to define the parts of speech and state rules, but that he may understand the logic of the sentence. All parsing and analysis should be made a study in relations among words and sentences. Diagrams are of little real aid, and are likely to create a wrong impression of the purpose of the work. No pupil should be graduated who cannot analyze correctly a normal English sentence of moderate complexity.

Composition and Rhetoric. Training in the use of the language

should be a part of the work in English throughout the course. The English, spoken and written, of the pupils should be watched and corrected not only in their English classes, indeed, but in all their written work. The principles governing punctuation, the use of words, paragraphs, and the different kinds of whole composition, including letter-writing, should be thoroughly mastered. In the English classes, it is advised that set exercises be required every week for the first two years, and, in the third and fourth years, in addition to these exercises, a carefully prepared paper at least once a month; that a due proportion of the class time be devoted to the discussion of these exercises and to explanation of the simpler rules of good writing; and that the exercises be then re-written with correction of errors. The pupil's work in literature, his other studies, and his daily experiences will furnish abundant topics for these exercises. It is most earnestly urged upon teachers that a certain standard of skill in writing be established for each year, and that no pupil be advanced to a higher class in English until he has reached that standard in his written work.

List of Readings in Literature. The list of readings in literature recommended by the National Conference on Uniform Entrance Requirements in English at its last meetings (February 22, 23—May 30, 1912) for the years 1915-1919, and approved by the University, is as follows:

A. READING. The aim of this course is to foster in the student the habit of intelligent reading and to develop a taste for good literature, by giving him a first-hand knowledge of some of its best specimens. He should read the books carefully, but his attention should not be so fixed upon details that he fails to appreciate the main purpose and charm of what he reads.

With a view to large freedom of choice, the books provided for reading are arranged in the following groups, from each of which at least two selections are to be made, except as otherwise provided under Group I.

Group I. Classics in Translation. The *Old Testament*, comprising at least the chief narrative episodes in Genesis, Exodus, Joshua, Judges, Samuel, Kings, and Daniel, together with the books of Ruth and Esther; the *Odyssey*, with the omission, if desired, of Books, I, II, III, IV, V, XV, XVI, XVII; the *Iliad*, with the omission, if desired, of Books XI, XIII, XIV, XV, XVII, XXI; Virgil's *Aeneid*. The *Odyssey*, *Iliad*, and *Aeneid* should be read in English translations of recognized literary excellence.

For any selection from this group a selection from any other group may be substituted.

Group II. Shakespeare. *Midsummer-Night's Dream*, *Merchant of Venice*, *As You Like It*, *Twelfth Night*, *The Tempest*, *Romeo and Juliet*, *King John*, *Richard II*, *Richard III*, *Henry V*, and *Coriolanus*; and, if not chosen for study under B, *Julius Caesar*, *Macbeth*, and *Hamlet*.

Group III. Prose Fiction. Malory: *Morte d' Arthur* (about 100 pages). Bunyan: *Pilgrim's Progress*, Part I. Swift: *Gulliver's Travels* (voyages to Lilliput and to Brobdingnag.) Defoe: *Robinson Crusoe*, Part I. Goldsmith: *Vicar of Wakefield*. Frances Burney: *Evelina*. Scott's novels: any one. Jane Austen's novels: any one. Maria Edgeworth: *Castle Rackrent*, or *The Absentee*. Dickens's novels: any one. Thackeray's novels: any one. George Eliot's novels: any one. Mrs. Gaskell: *Cranford*. Kingsley: *Westward Ho!* or *Hereward, the Wake*. Reade: *The Cloister and the Hearth*. Blackmore: *Lorna Doone*. Hughes: *Tom Brown's Schooldays*. Stevenson: *Treasure Island*, or *Kidnapped*, or *Master of Ballantrae*. Cooper's novels: any one. Poe: selected tales. Hawthorne: *The House of Seven Gables*, or *Twice Told Tales*, or *Mosses from an Old Manse*. A collection of short stories by various standard writers.

Group IV. Essays, Biography, etc. Addison and Steele: *The Sir Roger de Coverley Papers*, or selections from the *Tatler* and *Spectator* (about 200 pages). Boswell: selections from the *Life of Johnson* (about 200 pages). Franklin: *Autobiography*. Irving: selections from *The Sketch Book* (about 200 pages), or *Life of Goldsmith*. Southey: *Life of Nelson*. Lamb: selections from the *Essays of Elia* (about 100 pages). Lockhart: selections from the *Life of Scott* (about 200 pages). Thackeray: lectures on Swift, Addison, and Steele in the *English Humorists*. Macaulay: any one of the following essays—*Lord Clive*, *Warren Hastings*, *Milton*, *Addison*, *Goldsmith*, *Fredrick the Great*, *Madame d'Arblay*. Trevelyan: selections from the *Life of Macaulay* (about 200 pages). Ruskin: *Sesame and Lilies*, or selections (about 150 pages). Dana: *Two Years before the Mast*. Lincoln: selections, including at least the two Inaugurals, the Speeches in Independence Hall and at Gettysburg, the Last Public Address, the Letter to Horace Greeley; together with a brief memoir or estimate of Lincoln. Parkman: *The Oregon Trail*. Thoreau: *Walden*. Lowell: selected essays (about 150 pages). Holmes: *The Autocrat of the Breakfast Table*. Stevenson: *An Inland Voyage* and *Travels with a Donkey*. Huxley: *Autobiography* and selections from *Lay Sermons*, including the addresses on *Improving Natural Knowledge*, *A Liberal Education*, and *A Piece of Chalk*. A collection of essays by Bacon, Lamb, De Quincey, Hazlitt, Emerson, and later writers. A collection of letters by various standard writers.

Group V. Poetry. Palgrave's *Golden Treasury* (First Series):

Books II and III, with special attention to Dryden, Collins, Gray Cowper, and Burns. Palgrave's *Golden Treasury* (First Series), Book IV, with special attention to Wordsworth, Keats, and Shelley (if not chosen for study under B). Goldsmith: *The Traveller* and *The Deserted Village*. Pope: *The Rape of the Lock*. A collection of English and Scottish ballads, as, for example, some Robin Hood ballads, *The Battle of Otterburn*, *King Estmere*, *Young Beichan*, *Bewick and Grahame*, *Sir Patrick Spens*, and a selection from later ballads. Coleridge: *The Ancient Mariner*, *Christabel*, and *Kubla Khan*. Byron: *Childe Harold*, *Canto III or IV*, and *The Prisoner of Chillon*. Scott: *The Lady of the Lake*, or *Marmion*. Macaulay: *The Lays of Ancient Rome*, *The Battle of Naseby*, *The Armada*, *Ivry*. Tennyson: *The Princess*, or *Gareth and Lynette*, *Lancelot and Elaine*, and *Passing of Arthur*. Browning: *Cavalier Tunes*, *The Lost Leader*, *How They Brought the Good News from Ghent to Aix*, *Home Thoughts from Abroad*, *Home Thoughts from the Sea*, *Incident of the French Camp*, *Hervé Riel*, *Pheidippides*, *My Last Duchess*, *Up at a Villa—Down in the City*, *The Italian in England*, *The Patriot*, *The Pied Piper*, *De Gustibus—*, *Instans Tyrannus*. Arnold: *Sohrab and Rustum*, and *The Forsaken Merman*. Selections from American poetry, with special attention to Poe, Lowell, Longfellow, and Whittier.

[The list for 1913 and 1914 differs in many points from that for 1915-1919. For the 1913 and 1914 list, see the University Catalogue for 1912-1913. The list here given is intended by the National Conference to supersede the previously announced requirements for 1915. Nearly all the publishers of English school texts issue these lists in convenient form, and will send them on application. For the full official report of the 1912 Conference, address Mr. Wilson Farrand, Newark Academy, Newark, N. J.]

B. STUDY. This part of the requirements is intended as a natural and logical continuation of the student's earlier reading, with greater stress laid upon form and style, the exact meaning of words and phrases, and the understanding of allusions. The books provided for study are arranged in four groups, from each of which one selection is to be made.

Group I. Drama. Shakespeare: *Julius Caesar*, *Macbeth*, *Hamlet*.

Group II. Poetry. Milton: *L'Allegro*, *Il Penseroso*, and either *Comus* or *Lycidas*. Tennyson: *The Coming of Arthur*, *The Holy Grail*, and *The Passing of Arthur*. The selections from Wordsworth, Keats, and Shelley in Book IV of Palgrave's *Golden Treasury* (First Series).

Group III. Oratory. Burke: *Speech on Conciliation with America*. Macaulay's *Speech on Copyright* and Lincoln's *Speech at Cooper Union*. Washington's *Farewell Address* and Webster's *First Bunker Hill Oration*.

Group IV. Essays. Carlyle: *Essay on Burns*, with a selection from Burns's Poems. Macaulay: *Life of Johnson*. Emerson: *Essay on Manners*."

The Course of Study. The suggested course outlined below covers four years, and each year is divided into two terms.

It provides for the study of grammar, composition, and literature in suitable proportions. It attempts also to assign to a suitable place in the course most of the items in the Conference list of readings. Titles *starred* are recommended for class room study, the others for outside reading. All the literature in the Conference list may well be read in the course of the four years.

Figures following the different subjects indicate the proportion of the whole English time (five periods a week) of the term to be given to each subject. They do not mean that in each week so much time shall be given to grammar, so much to composition, and so much to literature. On the contrary, it is better, both in grammar and in literature, to work intensively, giving consecutive class periods to one topic until it is mastered and then proceeding similarly with another. Drill in the conventional usages of composition, on the other hand, involving as it does the acquiring of habits, should be kept up steadily, alongside of the other studies. The suggested course is as follows:

FIRST YEAR

First Half. (Grammar 2, composition 2, literature 1.)

Grammar.—The parts of speech; subject and predicate.

Composition.—Exercises in capitalization, punctuation, and sentence form. Invention, oral and written, in connection with the literature read. Letter-writing.

Literature.—*The Lady of the Lake**; *Treasure Island*; *Arabian Nights*; *Ivanhoe*; *Iliad*; *Tale of Two Cities*; *Last of the Mohicans*; *Old Testament Stories* (H. M. Co.).

Second Half. (Grammar 3, composition 1, literature 1.)

Grammar.—Number; case and case relations; transitive and intransitive verbs; complements of the verb; tense; passive voice; compound verb-forms; sentence, clause, and phrase; relatives.

Composition.—Exercises in punctuation and sentence-form continued. Paragraph division and paragraph development. Original work in narration and description on subjects suggested by the literature read.

Literature.—*Vision of Sir Launfal**; *Snow-Bound**; *Odyssey*; *Kidnapped*; Lamb's *Tales from Shakespeare*; *Rip Van Winkle*; Franklin's *Autobiography*; *Quentin Durward*; *Robinson Crusoe*.

SECOND YEAR

First Half. (Grammar $\frac{1}{2}$, composition 2, literature $2\frac{1}{2}$.)

Grammar.—Classification of sentences (simple, complex, compound; declarative, interrogative, exclamatory.)

Composition.—Exercises in sentence form, punctuation, and vocabulary. Correction of vulgar errors of speech and writing. Unity and coherence of paragraphs. Invention, oral and written, on topics drawn from the pupil's experience.

Literature.—*As You Like It**; *Merchant of Venice**; Southey's *Life of Nelson*; Butler's *Gordon* (Macmillan's Men of Action Series); *Kenilworth*; *The House of the Seven Gables*; *The Deserted Village*.

Second Half. (Composition 2, literature 3.)

Composition.—Review of punctuation, with special attention to comma, semicolon, full stops, and quotation marks. Constructive exercises in different types of sentence form. Repetitive exercises upon the literature read, to enlarge the vocabulary.

Literature.—*The Ancient Mariner**; *The Passing of Arthur**; *David Copperfield*; *Lorna Doone*; the *Aeneid*; *A Christmas Carol* and *The Chimes*; *The Cricket on the Hearth*; *Golden Treasury* III and IV*.

THIRD YEAR.

First Half. (Composition 2, literature 3.)

Composition.—Exercises in invention, descriptive or narrative. The whole composition; its theme (unity), and its plan (sequence). Outlines drawn up, and developed both orally and in writing, on topics drawn either from reading or from experience. Study of the connotation of words.

Literature.—*Midsummer-Night's Dream*; *Idylls of the King**; *Twelfth Night*; *Sketch Book*; *Succession of Forest Trees**; *Travels with a Donkey*; *DeCoverley Papers*; *The Tempest*; *The Black Arrow*; *Esther*; *Ruth*.

Second Half. (Grammar 1, composition 2, literature 2.)

Grammar.—Mood and the modal auxiliaries; the participle and the infinitive.

Composition.—Exercises in invention, expository and argumentative. The making of outlines by analysis of propositions; paratopic-sentences and their development; transitions; emphasis by arrangement; how to gather material from experience, observation, reading, and reflection; the right use of reading in original composition; the MS. conventions of citation, quotation, and reference; accuracy of diction.

Literature.—*Pied Piper* and Browning's shorter poems*; Washington's *Farewell Address*; Webster's *First Bunker Hill Oration*; Park-

man's *Oregon Trail*; *Golden Treasury II**; Selections from Lincoln; *Dr. Jekyll and Mr. Hyde*; *Genesis*, *Exodus*, *Joshua*, and *Judges*.

FOURTH YEAR

First Half. (Grammar 1, composition 1, literature 3.)

Grammar.—General review of sentence analysis; idioms and vulgarisms; principles of etymology.

Composition.—Original written work confirming the principles and methods learned in the third year, with special attention to vocabulary and thought development.

Literature.—History of English literature to Milton; *Macbeth**; *Henry V*; *L'Allegro**; *Il Penseroso**; *Lycidas**; selections from Wordsworth and Burns; Plato's *Apology* (Paul More's translation, Houghton, Mifflin), *Crito*, and *Phaedo*; *Autocrat of the Breakfast Table*; De Quincey's *Joan of Arc* and *The English Mail Coach**.

Second Half. (Composition 1, literature 4.)

Composition.—Review of the mechanics of written form and the chief details of good use, with drill as found necessary. Rhetorical types of sentences. Original written work based on study and reflection; oral debate.

Literature.—History of English literature from Milton to the present; *Beowulf* (in translation); *Golden Treasury I**; *Julius Caesar**; *Henry VIII*; *Cotter's Saturday Night*; Carlyle's *Burns*; *Tintern Abbey**; *Walden*; Burke's *Speech on Conciliation with the Colonies**; *The Scarlet Letter*; *Romola*.

For library equipment, see pages 84-89.

MATHEMATICS

FOUR UNITS MAY BE OFFERED

The four units which may be offered in mathematics are as follows:

Algebra. One unit. Elementary Algebra, including the topics usually presented up to and including the solution of quadratic equations by factoring. The following modifications are recommended, but the omissions from the traditional treatment should not be made without a compensating insertion of work to stimulate actual thinking about the mathematical aspects of concrete things. To assist in this, is the purpose of these suggestions.

The four fundamental operations may be carried out only on arithmetical numbers and on algebraic expressions not longer than trinomials.

Factoring may be limited to forms of the types, the difference of

two squares, the square of a sum or of a difference, and monomial factors.

In fractions, the work may be limited to examples, the terms of which are not longer than trinomials, and complicated complex fractions may be omitted; but the interpretations of the rules of Arithmetic in algebraic symbols with a review of arithmetical problems should be included.

Square root may be limited to square roots of arithmetical numbers, monomials, and the squares of binomials, and cube root may be limited to arithmetical numbers and monomials. This should be accompanied by explicit numerical calculations, application to mensuration, and if possible, the construction and use of small tables of squares and square roots.

Exponents may be limited to positive integral exponents below 10, but should include such illustrations as arise in the mensuration formulas of Geometry. The actual working of a slide rule without any theory of logarithms may be shown to students in this connection.

Linear and simultaneous linear equations may be limited to two equations in two unknowns, with emphasis on one equation in one unknown. As great a variety of practical problems of the usual types as is possible, and practical problems of Arithmetic by algebraic methods, should be given. For example, the study of isolated numerical problems in percentage can never give the student complete control of percentage, unless that student has unusual powers of generalization. The statement of the general principle underlying percentage is fundamentally algebraic, and this topic should be treated in algebraic formulation as a standard part of the course. This applies not only to percentage, but to every topic in which general formulation of a principle is possible. What is suggested for percentage should be done also for fractions, for proportion, for mensuration rules, etc. The practical problems should include, also, applications of such rules as the rule of the lever, problems on speed, etc.

Quadratic equations may be limited to the solution of numerical examples by factoring; but should include numerous problems stated in English, and such applications as Geometry affords, including the Pythagorean theorem, or those dependent on the falling body formulas.

Graphical processes should begin with graphical representations of quantities by straight lines, circles or other areas, as in representations of statistics, in encyclopedias, geographies, and in many advertisements. They should include, also, the representation of negative quantities, with such illustrations as are afforded by the thermometer, the representation of statistics, and graphs of linear and quadratic equations. With this should be combined the study of variation of quantities, and the dependence of one quantity upon another by any type of formula.

Algebra. One and one-half Units. Complete elements of Algebra in-

cluding the above and also the following: the solution of quadratic equations by completing the square, with emphasis only on those examples where the roots are real; simultaneous quadratics only in a few simple examples that can readily be illustrated by graphs, with emphasis only on the cases where one equation is linear; the binomial theorem for positive integral exponents, with emphasis only on the cases where the exponent is less than five; ratio and proportion only in the sense of fractional equations, including, however, graphical representation of two variable quantities, one of which is proportional to the other; arithmetic and geometric progression in the usual sense; practical use of logarithms restricted to the base 10, and emphasizing the use of a table (preferably four place— see bibliography listed under “library equipment”); fractional and negative exponents with special reference to logarithms, accompanied, if possible, by the practical use of the slide rule (see bibliography listed under “library equipment”); and those practical problems in which quantities raised to fractional powers occur.

Plane Geometry. One unit. The work in Plane Geometry, in order to be acceptable, must cover a full year in some good text. Teachers are urged to avoid the error that has crept into our traditional courses in Geometry of emphasizing the mere forms of logic at the expense of *geometric thinking*. The main subject-matter of the course should not be the methods by which the conclusions are reached. Proofs should be given, but the proof should not be made the end. Rather, the fundamental aim should be to enable the student to see the geometric truths in any geometric figure quickly and to appreciate their significance.

It is recommended that strong emphasis be placed on a very few of the most important theorems, such as the congruence theorems, the similarity theorems, the Pythagorean theorem, etc., and that the student be led to see that he need not remember many of the lesser theorems, provided he knows how to get them by reference to these larger theorems, whenever he wants them. The student should thus see that the logic of the subject plays a large part in assisting the memory and in relieving the memory from unnecessary burdens. Original demonstrations should form an important part of the work.

It is recommended that informal proofs be accepted for some of the most obvious theorems and that the notion of a strictly logical proof be developed gradually, as the student can be led to see the need for such proof. The theory of limits and the proofs for the incommensurable cases may be omitted or only briefly explained by the teacher.

It is recommended that part of the year be spent on the applications of Algebra to Geometry and of Geometry to Algebra. The connection between Algebra and Geometry now established in the graphical and concrete work in Algebra should not be forgotten. The student's knowledge of Algebra may be kept alive and even slightly extended, and

his appreciation of its value greatly strengthened, by frequent incidental use of it throughout the course in Geometry.

It is very desirable that the student should gain in the grades and in connection with the concrete work in Algebra an intimate acquaintance with the objects dealt with in Geometry, and with many of the facts of Geometry, in order that when the regular work in this subject is taken up, it may not be wholly novel to him.

A specially favorable opportunity to make Geometry seem of real value to the student consists in the applications of the theorems on similar triangles to the graphical solution of triangles by drawing them to scale and measuring the unknown parts with ruler and protractor. In this connection, the simplest notions of Trigonometry may be introduced with profit. A small ten cent table of logarithms and trigonometric functions may be obtained (see the bibliography listed under "library equipment"). Familiarity with such a table will do much to enliven the work and incidentally pave the way for an easier understanding of Trigonometry.

For a detailed discussion of these questions, see the report on Geometry which was presented to the National Educational Association in the summer of 1912. This report was issued in a separate pamphlet accompanying the proceedings of the N. E. A. for 1912; a preliminary report was printed in "School Science and Mathematics," 1911, and the final report was reprinted in "The Mathematics Teacher," Dec., 1912.

Arithmetic. One-half Unit. This half unit will not be approved unless it is given after the completion of the elementary courses in Algebra and Geometry. This work in Arithmetic should not be divorced from Algebra and Geometry. Rather the use of principles of Algebra and Geometry should be encouraged, so that the whole point of view in this course can be made more mature and more general than the elementary course in Arithmetic in the graded school. On the other hand, Algebraic and Geometric work should be done only as it is really valuable. Extended variety of topics is by no means so desirable as a careful study of the meaning of the simpler and more fundamental processes of Arithmetic together with application to problems drawn as widely as possible from Geometry, Physics, mensuration, business and other subjects with which the student is already familiar.

Topics deserving special attention are the following:

The fundamental processes on fractions should be accompanied by a statement of the general principles in algebraic form. Percentage should be clearly shown to be a special case of fractions, and its general principles should be presented in algebraic formulation.

Square root should be accompanied by practical computation emphasizing its applications in mensuration; and the student should be

encouraged to use tables of squares, square roots, cubes and cube roots, if such tables are available.

Practical problems that involve the use of actual plans of houses and diagrams of machinery, which can be obtained freely from firms of architects and firms of machinery manufacturers, should be used, if possible.

Business forms should include forms of checks, notes, drafts, etc. Special attention is called to the value of a study of interest tables, insurance rate books, tables of freight rates, postal rates, etc.

For reference, as a source of material for problems, and on account of useful tables they contain the library should be supplied with at least one standard engineers' handbook (see bibliography listed under "library equipment"), and with such a book as the New York World Almanac. Some such material is available also in large encyclopedias.

The high school should own also at least one standard slide rule of not less than 8 inches in length, and a protractor. The laboratory of Physics may supply such instruments as the vernier caliper, whose use should be made clear in this course, even if the student has had no laboratory work.

An effort should be made to explain other mathematical instruments in commercial use, such as water meters, light meters, cyclometers, adding machines; and samples of such devices should be added to the equipment of the school as opportunity affords.

Algebra. Additional one-half unit. This half unit will not be approved unless it is given after the completion of the elementary course in Algebra and Geometry. The course should follow the general spirit of the courses outlined above, but it should cover the more technical phases of Algebra omitted in what precedes. Thus factoring should be extended to such forms as the sum of the n th powers of two quantities ($X^n + Y^n$), the factor theorem and the remainder theorem.

The technique of the four fundamental operations and fractions should be improved by considerable drill work, using polynomials of greater length, and literal co-efficients. The work in linear equations should include three equations in three unknowns; the work in quadratic equations should include the properties of the roots of quadratics and the solution of the simpler cases of simultaneous quadratics.

The work in exponents should cover operations with literal exponents and the theory of logarithms to any base. The course should cover also the solution of equations of higher degree by graphical methods, and the general case of the binomial theorem for positive integral exponents, together with other simple cases of algebraic induction.

Any high school text not intended principally for first year work

will include these topics, but scarcely any omission can be made in the usual book, if two units are to be approved.

Solid Geometry. One-half unit. The work in Solid Geometry should cover a full half year's work. The logical side of the work may be somewhat subordinated, thoroughly emphasizing the question of space intuition and the more important mensuration formulas. The student's space conception may well be aided by the construction and study of models, and by the experimental verification of formulas.

Trigonometry. One-half unit. This is supposed to cover a half year's work. The ability to solve a right triangle and any oblique triangle by dividing it into right triangles without using logarithms should be emphasized above everything else. The ability to read tables, to interpolate properly, and the ability to use tables of any kind that may be presented, is very important. The knowledge of logarithms and logarithmic methods of solution is of importance only secondary to the things mentioned above. Such other topics, as the formulas involving two angles, should be treated at least briefly.

For library equipment, see pages 89-90.

HISTORY

FOUR UNITS MAY BE OFFERED

The course of study recommended consists of a full year's work, five periods a week of forty minutes each, in each of the four fields of history—Ancient, Medieval and Modern, English, and American. In order to develop in the pupils the sense of historical unity and growth, the course of study should be so planned as to have one period or field succeed another in natural sequence. Accordingly, the course should begin with a year's work in Ancient History and this be followed by a second year devoted to Medieval and Modern History. The third year will, naturally, be devoted to English History, and the fourth to American History and American Government. If desired, English History may be given in the second year and Medieval and Modern in the third year, without seriously affecting the continuity or value of the instruction. A reason for such transposition may be found in the relative difficulty of the two courses, both from the teacher's and pupil's standpoints.

For a three years' course of study, Ancient History should be followed in the second year by Medieval and Modern History, with attention to English History as a part of the field, or by English History, with attention given to continental European history, and in the third or fourth year American History, or American History and American Government, should be studied.

A two years' course should comprise a year's work in Ancient History followed by a year of Medieval and Modern History. Such a brief course, however, is not recommended, and accredited schools offering but two units should make every effort to add another year's work in history to their programme, or, better still, two years additional.

The following brief statements with regard to the several units will serve to indicate the scope of the course and the type of text-books that should be used.

Ancient History. One unit. The completion of a careful and thorough course of study extending over one entire school year in ancient Oriental, Greek, and Roman history. The list following will indicate the type of books that should be used as the basis for this course: Botsford, *History of the Ancient World*, Macmillan; Goodspeed, *History of the Ancient World*, Scribner; Morey, *Outline of Ancient History*, American Book Co.; Myers, *Ancient History* (Rev. Ed.) Ginn; West, *The Ancient World*, Allyn & Bacon; Westermann, *Story of the Ancient Nations*, Appleton; Wolfson, *Essentials in Ancient History*, American Book Co.

Medieval and Modern History. One unit. A year's study of the history of the European nations and their development and institutions from the period of the Germanic invasions to the close of the nineteenth century. The course should be based on a standard high school text such as: Adams, *Mediaeval and Modern History*, Macmillan; Bourne, *Mediaeval and Modern History*, Longmans, Green; Harding, *Essentials in Mediaeval and Modern History*, American Book Co.; Munro and Whitcomb, *Mediaeval and Modern History*, Appleton; Myers, *Mediaeval and Modern History* (Rev. Ed.) Ginn; Robinson, *History of Western Europe*, Ginn; Thatcher and Schwill, *General History of Europe, 350—1900 A. D.*, Scribner; West, *Modern History*, Allyn & Bacon.

English History. One unit. A thorough study of English political, governmental, economic and social history extending through one full school year and based on any standard text-book such as: Andrews, *History of England*, Allyn & Bacon; Cheyney, *Short History of England*, Ginn; Coman and Kendall, *History of England*, Macmillan; Larned, *History of England*, Houghton, Mifflin; Terry, *History of England for Schools*, Scott, Foresman (Chicago); Tout, *Advanced History of England*, Longmans, Green; Walker, *Essentials in English History*, American Book Co.; Wrong, *History of the British Nation*, Appleton.

Note.—A half unit in English History will be given for a shorter course of study based on less advanced texts such as Higginson and Channing's *History of England*; Ransome's *Short History of England*, and Montgomery's *English History*. The half-unit course is not recom-

mended, however, and the half-unit course should be given only when it is impossible to devote a full year to the subject.

American History. One unit. This course should embrace a year of advanced work in American political, social and institutional history with special reference to the period since 1763. The following textbooks suggest a standard for this course: Adams and Trent, *History of the United States*, Allyn & Bacon; Ashley, *American History*, Macmillan; Channing, *Student's History of the United States*, Macmillan; Hart, *Essentials of American History*, American Book Co.; James & Sanford, *History of the United States*, Scribners; Larned, *History of the United States*, Houghton, Mifflin; McLaughlin and Van Tyne, *History of the United States*, Appleton; Montgomery, *Student's American History*, (Rev. Ed.) Ginn; Muzzey, *American History*, Ginn; Woodburn and Moran, *American History and Government*, Longmans, Green.

Note.—A half-unit in American History will be given for a briefer, or half year, course of an advanced character but less comprehensive in scope. Such a course is not recommended, however, save in connection with the half-unit in American Government.

For list of maps and library equipment, see pages 90-102.

AMERICAN GOVERNMENT (CIVIL GOVERNMENT)

ONE-HALF UNIT MAY BE OFFERED

Course of Study. Systematic instruction in American Government should be postponed to the last year of the course of the secondary school. There is a distinct advantage in this plan. If given in the earlier years the work would be largely a review of what had been done in the last year of the elementary school. Still more important is the consideration that the senior in the secondary school is a much better subject for such instruction than are pupils in the first and second years. He will be much more appreciative of the spirit and content of the course.

American Government should be given as a distinct course and not as a part of the work in American History. History, however, is so essential to good results in the teaching of government that credit will not be given for work in American Government unless it is preceded by at least one-half year's work in American History. The best plan is to offer American Government in the second half of the senior year following American History in the first half of such year. It is recommended, moreover, that during the earlier years of the course much incidental instruction in American Government should accompany the work in History and Geography. Emphasis should be placed upon the historical development of political institutions in order that the pupil may be brought to a true understanding of what may otherwise appear arbitrary and irrational.

Methods of Instruction. The course should begin with a study of local government. The pupil can be made to understand local institutions much more readily than those of the state or nation since the former come within the range of his personal experience. In his daily life he is brought into contact with organs and activities of local government and these should be seized upon by the teacher as object lessons to illustrate the work of the course. The city will furnish the best and most numerous illustrations of this character. It will be relatively an easy matter to excite the curiosity and arouse the interest of the pupil in governmental organs which he can see and whose activities are brought home to him. In this way he will receive a real training in citizenship. From the institutions of the city it will be possible to proceed in like manner to those of the county, state and nation.

The pupil's interest in the work can be retained and heightened by visits to places which have to do with governmental activities. The city hall, public water and lighting plants, the public library, postoffice, the school itself,—all will furnish excellent means for illustrating the work in American Government. The pupil should be encouraged to study the government of his city and make reports upon various phases of its organization and work, e. g., the mayor, city clerk, street improvement, lighting, etc. The work in American Government may also be supplemented by having the school debating societies discuss questions of civic interest.

A good text-book is desirable. In many cases its arrangement may not correspond to the above plan but it will be possible to take up the parts of the text in a different order from that in which they are presented. The text-book must be largely supplemented by the teacher and by collateral reading and reference work. A small reference library is essential.

For library equipment, see pages 102-104.

LATIN

FOUR UNITS MAY BE OFFERED

The student should acquire such a vocabulary and such a knowledge of inflections and syntax as to read readily simple Latin prose with accurate quantitative pronunciation of the words. He should be carefully trained in reading Latin aloud, with proper emphasis and expression, and in rendering Latin into choice, idiomatic English. In addition to the reading, there should be considerable practice throughout the four years in writing Latin, and in making accurate written translations. There should be some sight reading each week after the first year.

The *first year* should be spent in thoroughly mastering the elements of the language as given by such beginners' books as D'Ooge's, Hale's, Bennett's, Collar and Daniell's, or Pearson's.

During the *second year*, four books of Caesar's *Gallic War* should be read. An equivalent of Nepos, Viri Romae, or Eutropius may be substituted for one book of Caesar, if the pupils need some simple Latin as a bridge. This is not recommended, however, unless it is absolutely necessary. An equivalent amount of Caesar's *Civil War* may be read instead of the *Gallic War*. This is recommended especially in the case of classes in which a large number are going over the year's work a second time. The reading should be accompanied by a careful and systematic review of grammatical forms and by a study of the leading principles of syntax. The latter should be impressed upon the pupil's mind by the translation into Latin of English sentences, based upon the text read. One exercise a week should be given entirely to this composition work, in which the marking of all long vowels should be insisted on.

During the *third year* the following orations of Cicero are usually read: four orations against Catiline, the oration for the Manilian Law, the oration for the Poet Archias. Instead of these, an equivalent may be read in Sallust's *Catiline*. The grammar and composition work of the preceding year should be continued.

It is recommended that the *fourth year* be begun by the reading of about a thousand lines of Ovid's *Metamorphoses*. This is to be followed by four or five books of Vergil's *Aeneid*, including the Sixth Book. If only four are read, about eight hundred lines from the *Eclogues* or *Georgics* should be read. If desired the whole year may be devoted to reading six books of the *Aeneid*. The technique of the Latin hexameter should be taught and its rhythm should be felt as quantitative and not merely translated into an accentual rhythm.

In connection with the reading of Latin, the mythology of the Greeks and Romans and the life and history of the Roman People should be thoroughly taught. The military, constitutional and private customs of the ancients should be carefully worked out by the teacher, who is thus enabled to illumine countless passages for the student. Map drawing by the student serves to impress upon his mind the geography of the ancient world.

For library equipment, see pages 104-112.

GREEK

THREE UNITS MAY BE OFFERED

The *first unit*, consisting of introductory lessons, should include (1) Xenophon's *Anabasis* (20 to 30 pages), (2) practice in reading at sight and in writing Greek, and (3) the beginning of systematic study of grammar.

The *second unit* should include (1) continuation of Xenophon's *Anabasis*, either alone or with other Attic prose (75 to 100 pages); (2)

practice in reading at sight, systematic study of grammar, thorough grammatical review and practice in writing Greek, both based on study of Books I and II of the *Anabasis*.

The *third unit* should include (1) Attic prose: e. g., *Lysias' Orationes*, or Plato's *Apology and Krito*, or Xenophon's *Memorabilia*, with practice in writing Greek, in grammar, and in reading at sight; (2) Homer (2500 to 4000 lines); e. g., *Odyssey* Books I-V, or *Iliad* Books I-III (omitting 11,499-end), and VI-VIII.

Useful text books for the above work are:

1. For the *first year's* work.—Ball's *Elements of Greek*, Macmillan; White's *First Greek Book*, Ginn; Gleason and Atherton's *First Greek Book*, American Book Co.; Gleason's *Gate to the Anabasis*, Ginn.

2. For the *second year's* work.—Mather and Hewitt's *Xenophon's Anabasis*, American Book Co.; Smith & Bonner, *Xenophon's Anabasis*, D. Appleton; Goodwin and White's *Xenophon's Anabasis*, Ginn; Goodwin's *Greek Grammar*, Ginn; Pearson's *Greek Prose Composition*, American Book Co.

3. For the *third year's* work.—Morgan's *Eight Orationes of Lysias*, Ginn; Wait's *Ten Select Orationes of Lysias*, American Book Co.; Bristol's *Ten Selected Orationes of Lysias*, Allyn and Bacon; Adams, *Selected Speeches of Lysias*, American Book Co.; Flagg's *Apology and Krito of Plato*, American Book Co.; Smith's *Xenophon's Memorabilia*, Ginn.

For library equipment, see pages 104-112.

GERMAN

THREE UNITS MAY BE OFFERED

The *first unit* should comprise: (1) Careful drill upon pronunciation. (2) Systematic drill upon the elements of grammar, including the inflection of the articles, the noun, the adjectives, the pronoun, the verb, strong and weak; also upon the use of the common prepositions, the simpler use of the modal auxiliaries and elementary rules of syntax and word-order. (3) Abundant practice (a) in oral and written reproduction of the text, (b) in the memorizing of colloquial and idiomatic phrases, and (c) in dictation.

All reading in this course should be intensive. The pupil should be required to give back the entire subject-matter in German, either in the form of German answers to German questions, repetitions from memory, or free oral or written reproduction. The teacher may use discretion as to the number of pages thus treated. Ordinarily a class cannot treat more than 100 pages in this manner with sufficient thoroughness. Texts such as the following are recommended: Guerber's *Märchen und Erzählungen I*, Seeligmann's *Altes und Neues, Glück Auf*, the easiest of Grimm's *Märchen*, the texts in Prokosch's *Introduction to German*.

The *second unit* calls for about 300 pages of moderately difficult reading, chiefly prose, with constant practice in oral and written reproduction of selected portions; also drill upon the more difficult chapters of grammar such as the passive voice, use of cases with prepositions, verbs, adjectives, uses of tenses and modes (especially the infinitive and subjunctive), likewise upon word-order, and word-formation. Thoroughness should be insisted upon rather than quantity. The following texts are among those recommended: (1) For reading, Baumbach's *Sommermärchen* and *Waldnovellen*, Leander's *Träumereien*, Zschokke's *Der zerbrochene Krug*, *Das Wirtshaus zu Cransac*, Storm's *Immensee*, Heyse's *L'Arrabiata*; (2) for composition, Pope's *Writing and Speaking German*; Stern's *Geschichten vom Rhein*, Manley's *Ein Sommer ein Deutschland*.

The *third unit* calls for (1) the reading of 400-500 pages of good modern prose stories and plays, and the ability to use the language effectively as a means of oral and written expression; and (2) abundant practice in the writing of composition. Among the texts recommended are: (narrative) Riehl's *Burg Neideck*; Sudermann's *Frau Sorge*; Storm's *Der Schimmelreiter*; (dramatic) Moser's *Der Bibliothekar*; Freytag's *Die Journalisten*; Helbig's *Komödie auf der Hochschule*; (historical) Sybel's *Die Erhebung Europas*; Schiller's *Der dreißigjährige Krieg*; Freytag's *Aus dem Jahrhundert des grossen Krieges*; Arndt's *Deutsche Patrioten*. A well-balanced course includes works of all the three classes mentioned.

For library equipment, see pages 112-116.

FRENCH

THREE UNITS MAY BE OFFERED

In general throughout the course the teacher should aim at quality rather than quantity.

First unit. The work of the first year should aim to give the student: (1) an accurate pronunciation; (2) a knowledge of the rudiments of the grammar; (3) the ability to translate simple sentences into French and to express in idiomatic French simple ideas; (4) the ability to understand simple ideas expressed orally in French; (5) a vocabulary and knowledge of construction sufficient to enable him to read ordinary French with considerable ease.

The drill in pronunciation should begin with the first meeting of the class and should continue unremittingly until the last. It is not only an end in itself but it makes for accuracy in the knowledge of grammatical forms and is a great aid in the retention of vocabulary. As a part of such drill frequent dictations are indispensable.

The grammatical work should include the regular and the more com-

mon irregular verbs, the inflection of nouns, adjectives, participles, and pronouns, the use of pronouns, adverbs, prepositions, and conjunctions, sentence-order, and the elements of syntax. The amount studied should be about that covered in Thieme and Effinger's *Grammar*, the first part of Fraser and Squair's *Grammar*, Aldrich and Foster's *Elementary French*, or Chardenal's *First French Course*.

A minimum of about 150 pages should be read. There are a number of readers which present a sufficient variety of graded material and some of the easier of the texts mentioned below as suitable for the second year could be used profitably. There should be constant practice in translating into French easy variations of the texts read, and this, in conjunction with the English sentences given in the grammar, will insure an abundance of drill in this respect.

Second unit. The work of the second year should include the reading of a minimum of 350 pages of modern prose, including a number of short dramatic works, with constant practice as before in retranslation of variants of the texts read. The drill in pronunciation and the writing of French from dictation should be continued. The grammar work should include a careful review of the ground covered in the first year, with drill upon all irregular verbs that are not very rare, the uses of the subjunctive, and a more detailed study of the syntax. There should be constant practice in the construction of sentences. Students should be required to give either orally or in writing abstracts of portions of the texts read. Any of the following texts, recommended by the Committee of Twelve of the Modern Language Association of America, are suitable for the second year: About's *Le Roi des Montagnes*; Bruno's *Le Tour de la France*; Daudet's easier short tales; La Bédollière's *La Mère Michel et Son Chat*; Erckmann-Chatrion's stories; Foa's *Contes Biographiques* and *Le Petit Robinson de Paris*; Foncin's *Le Pays de France*; Labiche and Martin's *La Poudre aux Yeux* and *Le Voyage de M. Perrichon*; Legouvé and Labiche's *La Cigale chez les Fourmis*; Malot's *Sans Famille*; Mairét's *Le Tâche du petit Pierre*; Mérimée's *Colomba*; extracts from Michelet; Sarcey's *Le Siège de Paris*; Verne's stories.

Third unit. The work of the third year should include the reading of from 600 to 1000 pages of French, with constant practice in paraphrasing and abstracting portions of the texts in French. The drill in pronunciation and in the writing of French from dictation should be continued unremittingly. A good grammar should be studied carefully. Students should be drilled in writing simple original themes in French. The texts recommended by the Committee of Twelve are as follows: About's stories; Augier and Sandeau's *Le Gendre de M. Poirier*; Béranger's poems; Corneille's *Le Cid* and *Horace*; Coppée's poems; Daudet's *La Belle-Nivernaise*; La Brète's *Mon Oncle et Mon Curé*; Madame de Sévigné's letters; Hugo's *Hernani* and *La Chute*; Labiche's plays; Loti's *Pêcheur d'Islande*;

Mignet's historical writings; Molière's *L'Avare* and *Le Bourgeois Gentilhomme*; Racine's *Athalie*, *Andromaque*, and *Esther*; George Sand's plays and stories; Sandeau's *Mademoiselle de la Seiglière*; Scribe's plays; Thierry's *Récits des Temps Mérovingiens*; Thiers's *L'Expédition de Bonaparte en Egypte*; Vigny's *Canne de Jonc*; Voltaire's historical writings. It is recommended, however, that only sparing use be made of the classical plays, especially those of Corneille and Racine, which are more suitable for a fourth year.

For library equipment, see pages 116-118.

SPANISH

THREE UNITS MAY BE OFFERED

The work in Spanish should aim at a combination of the practical and the esthetic. Emphasis throughout the course should be laid on beauty of expression, the characteristic tone of Spanish literature, historical and literary references, on the one hand, and a sure grasp of grammatical principles, thorough drill in verbs, and independent expression, both oral and written, on the other.

First unit. The instruction should above all be practical. Drill in variety should be the method, and thoroughness, the object. Students, on finishing this course, should be able to read easy texts like Hill's *Spanish Tales for Beginners* (Holt), Valera's *El Pájaro verde* (Ginn), and Carrión and Vital Aza's *Zaragüeta* (Silver, Burdett). About 150 pages of connected prose should be read. Exercises in the memorizing of vocabulary should be given frequently. A small portion of each period should be devoted to pronunciation and dictation. The conversational method should be employed as soon as possible and gradually enlarged in its application. For this purpose, a rather limited every-day vocabulary dealing with objects of common use, and Spanish and Latin-American life and customs should be compiled and put into practice, preferably in the form of short, rapid questions and answers. Nutt's *English-Spanish Conversation Dictionary* (Ritter and Flebbe, Boston) will be found helpful. Grammars recommended are Wagner's (Third Edition, Ann Arbor Press), Olmsted and Gordon's (Holt), Hills and Ford's (Heath). In composition work, any ten sentences illustrating each lesson should be sufficient.

Second unit. A rapid review of the grammar, along with the writing of all composition work, should be made. The class-room work should be carried on as largely as possible in Spanish. The reading of about 350 pages of modern prose, such as that of Galdós' *Marianela* (Heath), Valera's *El Comendador Mendoza* (Amer. Book Co.), Moratín's *El Sí de las Niñas* (Amer. Book Co.), is required. Some attention should be paid to literary qualities. Crawford's *Spanish Composition* (Holt) or an equivalent, should be used both for composition and conversation. The *Boletín*

de la Unión Panamericana (Washington, D. C.) will prove of interest and value to students.

Third unit. Some of the more difficult masterpieces should be taken up, and considerable time devoted to their value as literature. Pupils should be referred to good histories of Spanish literature, such as Fitzmaurice-Kelly's or Ticknor's. Three or four works of the caliber and length of Galdós' *Doña Perfecta* (Heath), Núñez de Arce's *El Haz de Leña* (Heath), Ford's *Selections from Don Quijote* (Heath), and Calderón's *La Vida es Sueño* (Amer. Book Co.) should be read. Umphrey's *Spanish Prose Composition* (Amer. Book Co.) is suitably graded for this year. The ability to converse should be developed. For grammatical reference, Ramsey's unabridged *Text-book of Modern Spanish* (Holt), and Bello y Cuervo, *Gramática de la Lengua Castellana* (A. Rogers), Paris, are suggested.

For library equipment, see page 118.

PHYSICS

TWO UNITS MAY BE OFFERED

The work of the *first unit* consists of three closely related parts; namely, class work, lecture-demonstration work, and laboratory work.

The class work includes the study of at least one standard text. It should aim to build up in the pupil's mind clear concepts of physical terms and quantities, and an intuitive appreciation of the general principles which make up the syllabus given below. The pupil should be trained in the use of those principles in the solution of simple, practical, concrete numerical problems.

In the laboratory, the pupil should perform at least thirty individual experiments, and should keep a careful note book record of them. At least twenty of these should involve numerical work and the determination of such quantitative relations as may be expressed in whole numbers. Such quantitative work should aim to foster the habit of thinking quantitatively, but should not attempt to verify laws with minute accuracy nor to determine known physical constants with elaborate apparatus. The list of topics covered by these quantitative experiments ought not to differ widely from the list of starred topics in the syllabus.

The teacher is not expected to follow the order of topics in the syllabus, unless he wishes to do so. The list is not intended to include all the material for the year's work. It is purposely made short, in order that each teacher may be free to supplement it in a way that fits his individual environment. It does include those topics which all agree are essential to a first course in Physics, and which are capable of comprehension by boys and girls of high school age.

The syllabus of topics is as follows:

- *1. Weight, center of gravity.
- *2. Density.
- *3. Parallelogram of forces.
- 4. Atmospheric pressure; barometer.
- *5. Boyle's law.
- 6. Pressure due to gravity in liquids with a free surface; varying depth, density, and shape of vessel.
- *7. Buoyancy; Archimedes' principle.
- *8. Pascal's law; hydraulic press.
- 9. Work as force times distance, and its measurement in foot-pounds and gram-centimeters.
- 10. Energy measured by work.
- *11. Law of machines: work obtained not greater than work put in; efficiency.
- *12. Inclined plane.
- *13. Pulleys, wheel and axle.
- *14. Measurement of moments by the product of force times arm; levers.
- 15. Thermometers: Fahrenheit and Centigrade scales.
- 16. Heat quantity and its measurement in gram calories.
- *17. Specific heat.
- *18. Evaporation; heat of vaporization of water.
- *19. Dew point; clouds and rain.
- *20. Fusion and solidification; heat of fusion.
- 21. Heat transference by conduction and convection.
- 22. Heat transference by radiation.
- 23. Qualitative description of the transfer of energy by waves.
- 24. Wave length and period of waves.
- 25. Sound originates at a vibrating body and is transmitted by waves in air.
- *26. Pitch and period of sound.
- *27. Relation between the wave length of a tone and the length of a string or organ pipe.
- *28. Resonance.
- 29. Beats.
- 30. Rectilinear propagation of light; pin-hole camera.
- *31. Reflection and its laws; image in a plane mirror.
- *32. Refraction, and its use in lenses; the eye, the camera.
- *33. Prisms and dispersion.
- 34. Velocity of light.
- 35. Magnetic attractions and repulsions.
- *36. Field of force about a magnet.
- 37. The earth a magnet; compass.
- 38. Electricity by friction.

- 39. Conductors and insulators.
- *40. Simple galvanic cell.
- *41. Electrolysis; definition of the ampere.
- *42. Heating effects; resistance; definition of the ohm.
- *43. Ohm's law; definition of the volt.
- *44. Magnetic field about a current; electromagnets.
- *45. Electromagnetic induction.
- *46. Simple alternating current dynamo of one loop.
- *47. Electromagnetic induction by breaking a circuit; primary and secondary.
- 48. Conservation of energy.

The notebook should be a concise record of what the pupil has done. The data should be so tabulated that any one familiar with the subject, or the pupil himself some months later, will be able to understand just what was done. It should be neat, clear and accurate, but the notebook is not the object of the course and too much time should not be put on it.

The text-book should be equal in grade to one of the following: Adams, American Book Co.; Carhart & Chute, Allyn & Bacon; Coleman, Heath; Hoadley, American Book Co.; Mann and Twiss, Scott, Foresman; Millikan and Gale, Ginn; Mumper, American Book Co.

For the laboratory it is advisable to use a laboratory manual separate from the text-book. There are now a number of excellent manuals published. The use of one of these will in general be much more satisfactory than notes which must be copied by the pupils. The following manuals are suggested: Adams, American Book Co.; Crew and Tatnall, Macmillan; Coleman, American Book Co.; Hoadley, American Book Co.; Nichols, Smith and Turton, Ginn; Millikan and Gale, Ginn; Reeve, American Book Co.; Twiss, Scott, Foresman.

A *second unit* may be given, consisting of a continuation of the laboratory work for another year, or a year's work in a more advanced text together with laboratory work.

For laboratory equipment, see pages 57-61.

For library equipment, see pages 118-119.

CHEMISTRY

TWO UNITS MAY BE OFFERED

The *first unit* should consist of a year's work as outlined in a standard text-book of high school grade. It should consist of two closely related parts; namely, recitations including demonstrations by the teacher, and laboratory work.

Each pupil should be provided with an outfit of apparatus for the laboratory exercises, which should be largely carried out by the pupils

working independently. A limited number of experiments, however, may be conducted by two pupils working together. Each pupil should record in a note book what he observes, and should do so at the time the observations are made. The interpretation of observed results and calculations may be recorded in the note book later, if the teacher so prefers.

As Chemistry is an art as well as a science, stress should be laid on handling and setting up apparatus in a neat and orderly manner. In the use of reagents, thought should be given to proportions, and the wasting of materials should be prevented. In experimentation, careful planning and skill of the hand should be emphasized. In this way the laboratory work becomes an interacting process of thinking, doing, and thinking. The pupils, for example, should know why an apparatus should be air tight and how to make it air tight; why gases are washed and dried, and how this operation must be done.

The text and reference books, as a rule, furnish an adequate and systematic account of the chemical changes selected for study, but the equally important feature of the course, the art of Chemistry, is imparted directly by the teacher.

In both laboratory and class work, the materials chosen for study should be restricted to a relatively small number of elements and their chief compounds. Interest in the work may be increased by applications of the facts and generalizations of the text to familiar phenomena in daily life. Visits should be made to the gas works, ice plant, lime kiln, and other chemical industries in the locality. The more important discoveries of Chemistry should become associated with the great masters of the science by anecdote, personal characteristics, or contemporary events.

A *second unit* may be given, consisting of more advanced work in the subject, during the same length of time as required for the first unit.

For laboratory equipment, see pages 61-65.

For library equipment, see pages 119-120.

GENERAL BIOLOGY

ONE UNIT MAY BE OFFERED

This course should be designed to present a general survey of biological science, including the life processes, the activities, the adaptations, as well as the structure of organisms, treated from the standpoint of their general relations. General Biology is the study of the fundamental properties of living things, as illustrated by a carefully selected series of both animal and plant forms.

The laboratory work guided by suitable directions, should precede text-book work on any subject, and the pupil should be required to make careful drawings and notes on all observations. Accurate observations and records of the normal activities of living animals and plants should be

made whenever practicable, both in the laboratory and in the field. Simple experiments upon the behavior of animals are very valuable, and should be made if possible.

The following series of forms for study is suggested: (1) amoeba; (2) paramoecium or vorticella; (3) haematococcus; (4) yeast plant; (5) spirogyra; (6) hydra; (7) mucor or penicillium; (8) earthworm; (9) crayfish; (10) grasshopper; (11) fern; (12) fresh water mussel; (13) seeds and seedlings; (14) flowering plant; (15) frog, with metamorphosis. Hunter's *Elements of Biology* is a good text for this work.

For laboratory equipment, see pages 65-68.

For library equipment, see pages 120-126.

BOTANY

TWO UNITS MAY BE OFFERED

The work of the *first unit* should deal, for the most part, with the seed plants, and should consist of recitations, laboratory work and field studies. While the study of structure is essential, yet most emphasis should be placed on the activities of plants. The studies with lower plants should deal almost entirely with gross structures, life habits and economic importance.

The following topics are suggested:

General Studies with Seed Plants.—(1) The parts of a mature plant—roots, stem, leaves, flower. (2) The functions of roots and their modifications. (3) The functions of stems and their modifications. (4) Buds. (5) Leaves and their work. (6) Flowers, parts, functions, adaptations for pollination. (7) Fruits, kinds, adaptations for dispersal, value to man. (8) Seeds, structure, germination, etc. (9) Relation of plants to light, soil, water, atmosphere. (10) Plant families, studies of common representatives of the important plant families, as the roses, legumes, grasses, lilies, composites, etc. Forests and forest trees may well be considered here.

Studies with Lower Plants.—(1) Algae, general appearance, abundance, local distribution, and relation to water supplies. (2) Bacteria, relation to decay, to soils, to disease in plants and animals, to purity of milk and water supplies, to public hygiene. (3) Molds, appearance, occurrence, importance in relation to food products. (4) Yeasts and fermentation. (5) Rusts, smuts, etc., as the cause of plant diseases, parasitic method of living, control of plant diseases. (6) Mushrooms, edible and poisonous, cultivation, agents in destruction of timber. (7) Liverwort, habits, distribution and life cycle. (8) Moss, habits, distribution and life cycle. (9) Fern, life cycle, distribution, local types.

Careful drawings, notes, and deductions should be made. The student should make his own studies first and then read his text.

This outline is not intended as an essential arrangement, for the latter is best determined by convenience. Any arrangement, however, should enlist the interest of the pupil in the living plant—the plant in action—and laboratory studies should be made to bear this out. It is better, also, to omit some of the topics suggested than to treat them inadequately. The teacher must determine the apportionment of time, and bring out the connection of the topics.

The *second unit* should cover essentially the same ground as is taken up in Coulter's *Plant Structures*, or Bergen and Davis' *Principles of Botany*, Part II, dealing with the morphology, evolution and classification of plants. A careful laboratory study of types of the great groups of plants should be made. The forms selected should be considered largely from the standpoint of evolution.

For laboratory equipment, see pages 65-68.

For library equipment, see pages 120-126.

ZOOLOGY

TWO UNITS MAY BE OFFERED

The study of each form should include a consideration of the following: (1) habitat; (2) geographical distribution; (3) food; (4) adaptations to environment, including relations to other forms of animal and plant life; (5) general activities; (6) economic relations; (7) life history, and (8) structure.

In Zoology the same methods of instruction should be followed as are outlined above under General Biology.

For the *first unit*, the following series of forms for study is suggested:—(1) Protozoa (amoeba, and paramoecium or vorticella). (2) A coelenterate, (hydra). (3) An echinoderm (starfish or sea-urchin). (4) An annelid worm (earthworm). (5) A parasitic worm (cestode or trematode). (6) A decapod crustacean (crayfish). (7) An orthopterous insect (grasshopper, and comparison with other orthoptera). (8) A coleopterous insect. (9) A lepidopterous insect, with *larva* and *pupa*. (10) A hymenopterous insect. (11) A pelecypod mollusc (fresh water mussel). (12) An amphibian (frog, with metamorphosis).

For high schools equipped to do thoroughly satisfactory work in Zoology, Linville and Kelly's *A Text-book in General Zoology* is recommended.

A *second unit* may be given, consisting of more advanced work in the subject, with a study of additional forms, during the same length of time as required for the first unit.

For laboratory equipment, see pages 65-68.

For library equipment, see pages 120-126.

PHYSIOLOGY

ONE UNIT MAY BE OFFERED

It is recommended that Physiology be preceded by a course in General Biology, or by a course either in Zoology or in Botany. At least two double periods a week should be given to laboratory demonstrations by the instructor and to dissections and physiological experiments performed by the student, always under careful supervision. In the high school Physiology course, a certain amount of time should be given to the anatomical study of structures which are to be used later for physiological experiment and demonstration; but the structures should be studied primarily for the sake of a better understanding of the functions. Careful notes and drawings of the structures dissected should be preserved for use as guides later in making physiological preparations. The laboratory experiments performed on the living organs and tissues should include tests to show the characteristics of muscular contraction, nerve irritability, blood pressure, the heart beat, the pulse, the capillary circulation, etc. Note books should be kept in connection with all physiological demonstrations. The notes should indicate the specific observations with regard to the living organs, and should show the results obtained from the study of mechanical records of such phenomena as occur too rapidly for direct observation. It is recommended that the elementary phases of physiological chemistry be presented in the subject of digestion, secretion, blood clotting, and the composition of one or two tissues. The original laboratory notes taken at the time of the experiment should be preserved.

The text-books and printed guides are numerous and a judicious amount of selection and elimination is necessary. Of the better high school texts may be mentioned, Martin's *Human Body*, revised edition; Hough and Sedgwick's, *The Human Mechanism*; Huxley's *Lessons in Elementary Physiology*, revised edition; Schenck and Guber's *Human Physiology*, translated by Zoethout; Hewe's *High School Physiology*, which has directions and suggestions for laboratory experiments; Walter's *Physiology and Hygiene*.

For laboratory equipment, see pages 68-69.

For library equipment, see pages 126-127.

PHYSICAL GEOGRAPHY**ONE UNIT MAY BE OFFERED**

The following outline includes only the more essential facts and principles of a unit course:

Mathematical Geography.—(1) Review of subject as presented in grammar school geography, including construction of diagrams to show inclination of the earth's axis to the plane of its orbit, perihelion and aphelion, position of equinox and solstice; measurement of sun's altitude by means of sun board; determination of latitude by measuring altitude of pole star. (2) The earth considered as a planet: rotation, proofs, results; revolution, proofs, results; magnetism, compass, poles, variation.

The Atmosphere.—Composition, extent and offices of the atmosphere. (2) Temperature: source of temperature; variation of temperature; isotherms; isothermal charts of the world for January and July. (3) Pressure: measurements of pressure; relation of pressure to temperature; study of isobars on United States weather map; distribution of pressure; relation of isobars to isotherms. (4) Atmospheric moisture: source; amount; how measured. (5) Atmospheric movements: winds, classes, direction, cause; special study of character and paths of storms in the United States. (6) Weather and climate; use of weather maps.

The Land.—(1) Earth materials: study of the common rocks and rock forming minerals; more detailed study of the rocks and soils of the locality. (2) Land forms, including, after the student has first been taught to interpret the Geological Survey Maps, a study of the following types of topography, illustrated by the maps: plains, simple plain, a plain with valleys, a plain with hills, a plain with hills and valleys; plateaus, simple plateau, plateau with valleys, plateau with hills, a plateau with hills and valleys; mountains, a simple mountain, a mountain with valleys. (3) Weathering: conditions affecting weathering; weathering agents; transportation of material; results of weathering. (4) Special study of the valley: including birth of valley; how it grows; how it gets a stream; limits of growth; accidents that may happen to valleys. (5) Ground water: source; amount; use. (6) The work of streams. (7) Work of ice: lake ice, river ice, seashore ice, snow line, snow fields, local and permanent; formation of glacial ice, glacial movements, types of glaciers, work of glaciers, icebergs. (8) The ancient ice sheet: evidence of its existence; how it developed; extent; center of dispersion; unglaciated areas; changes produced by erosion and deposition of material; characteristics of glaciated areas of United States.

Volcanoes and Volcanic Phenomena.—(1) General facts, kind and distribution. (2) Study of cone, dyke, crater, fissure, lava.

The Ocean.—(1) Form, divisions and general characteristics of the ocean. (2) Depth, density, temperature and composition of ocean waters. (3) Characteristics of ocean floor. (4) Distribution of life in ocean. (5) Movements of ocean water; waves, cause and effect; currents, causes and effects; more important currents; tides, character, cause. (6) Special study of shore lines.

The Earth and Man.—Relation of man, plants and animals to climate, land forms and ocean areas.

For laboratory equipment, see pages 69-73.

For library equipment, see pages 127-128.

AGRICULTURE

ONE UNIT MAY BE OFFERED

The work should consist of two parts, (1) individual laboratory and field work, and (2) recitations based upon the laboratory work, the text-book and assigned readings. Three periods a week should be given to the recitation and not less than two eighty-minute periods a week to laboratory and field work. As a rule, the laboratory and field work should precede rather than follow the recitation. Every school should have a small plat of ground, an acre or more, for a school farm and garden. It is not essential that the topics be studied in the order given below or in the order given in any text-book. A seasonal arrangement is strongly recommended. The work in animal husbandry should include a careful study of the principal types and breeds of the more common farm animals. Emphasis should be placed upon the study of horses, cattle, swine and poultry. There should be practice in stock judging, with the use of the score cards.

No special list of experiments is required. Each teacher should secure from the standard laboratory manuals a list of at least sixty experiments. These experiments are to be in addition to any experiments or demonstrations given by the teacher. Practically every topic in the outline given below may be made the basis of a profitable laboratory or field exercise. The outline is as follows:

Farm and Garden Crops.—(1) Plant propagation: seeds; buds. (2) Cereal crops: corn; wheat; oats; rye; barley. (3) The legumes: the clovers; cowpeas; soy beans; alfalfa; vetch. (4) Grass crops: timothy; bluegrass; red top; orchard grass; millet. (5) Orchard crops: apples; peaches; pears; plums; cherries; nuts. (6) Small fruits: strawberries; grapes; blackberries; raspberries; currants; gooseberries. (7) Kitchen garden crops: potatoes; sweet potatoes; tomatoes; melons; cabbages; cucumbers; radishes; lettuce; beans; peas; onions. (8) Fibrous and miscellaneous crops: cotton; flax; hemp; broom corn; castor beans; sor-

ghum. (9) The wood lot: timber crop. (10) Insect enemies of farm crops.

Soils.—(1) Origin and formation. (2) Composition and classification. (3) Soil water. (4) Soil air. (5) Soil temperature. (6) Soil drainage. (7) Soil organisms. (8) Meaning and method of testing the soil.

Animal Husbandry.—(1) The horse: origin and brief history; the two principal types, including the speed type and the draft type; breeds, including draft breeds (Percheron, Clydesdale and English Shire), roadsters (American trotter, American Saddle horse, English thoroughbred, Hackney, French coach); care of horses. (2) Cattle: origin and brief history; the two principal types (dairy cattle, beef cattle); breeds, including beef breeds (Shorthorn, Hereford, Polled Hereford, Aberdeen Angus, Polled Durham, Galloway), dairy cattle (Holstein, Friesian, Jersey, Guernsey, Ayrshire, Dutch Belted, Brown Swiss), dual purpose breeds (Shorthorn, Devon, Red Polled); cattle products, including meat, milk, leather, glue, etc. (3) Sheep: the two types, including wool-producing and mutton producing; principal breeds including wool-producing (American Merino, Delaine, Rambouillet), mutton producing (Shropshire, Southdown, Cotswold); care of sheep. (4) Swine: the principal breeds including Poland China, Berkshire, Duroc-Jersey, Chester White, Hampshire, Tamsworth, Large Yorkshire; care of swine; diseases of swine and how to control or prevent them, especially cholera and tuberculosis. (5) Poultry. (6) Chickens: the four principal types, including meat type, egg type, general purpose type, ornamental type; breeds, including meat type or Asiatic class (Brahma, Cochin, Langshan); egg types or Mediterranean class (Leghorns, Minorcas, Black Spanish); general purpose or American type (Plymouth Rock, Wyandotte, Rhode Island Red); care of poultry, including feeding chickens, the incubator, the chicken house; poultry and poultry products, importance, value and use.

Farm Management.—(1) Choice of farm. (2) Farm sanitation. (3) Farm buildings. (4) Farm machinery. (5) Maintenance of soil fertility. (6) Improvement of farm animals. (7) Farm records and accounts. (8) Feeds and feeding. (9) Miscellaneous problems.

Ornamental Gardening.—(1) Location of building and farm structures. (2) The lawn. (3) Roads, walks and drives. (4) Arrangement of trees, shrubs and flowers. (5) Planting and care.

For laboratory equipment, see pages 73-75.

For library equipment, text-books and laboratory manuals, see pages 128-129.

MUSIC

ONE UNIT MAY BE OFFERED

In the unit's work in Music, the pupils should acquire the ability to do the following:

1. To sing a selection (unaccompanied) in the key and time in which it is written, after having had the pitch "C" given to them. Either the "movable do" or "fixed do" methods may be used or better still the syllable "la" as disassociated from either. In the matter of difficulty, the selection should be on a par with songs found in books suitable for High School Choral practice, such as Hoff's *Corona Song Book*, Ripley and Tapper's *Advanced Music Reader* (The Natural Course), Smith's *Fourth Book* (The Modern Music Series), Tomlin's *Laurel Song Book*.

2. To name and qualify (perfect, major, minor, augmented, diminished) intervals struck on the piano, both in succession and combination, by other persons. The pupils should not see the keys as they are struck, but should recognize the intervals by ear. The tests as given under 1 and 2 are for the purpose of a clear recognition of tones and their symbols.

3. To write the chords to figured basses, implying a knowledge of the primary and secondary triads in major and minor and their inversions and of the chord of the dominant seventh with its inversions and resolutions. This work is covered in the first 77 pages of Jadassohn's *A Manual of Harmony*.

If the pupils have not had music in the grades, proficiency in sight reading may be acquired by the use of such books as *The Modern Music Series* (Primer, First Book, Second Book, Third Book), Silver, Burdett; *Educational Music Course* (First Reader, Second and Third Readers; Fourth and Fifth Readers), Ginn; and *Natural Music Course* (Primer, First Reader, Second Reader, Third Reader), American Book Co.

For continuing Music in the High Schools, such books as the following will be found serviceable: *The Laurel Song Book*, (Boston), C. C. Birchard; *The Corona Song Book*, Ginn; *Songs of the Nation*, Silver, Burdett; *Standard Songs and Choruses*, American Book Co.; *The Modern Music Series*—Fourth Book, Silver, Burdett; *Art Songs for High Schools*, American Book Co.

While sight-reading necessarily implies ear-training, special attention may be given to the latter subject by the use of such a book as Heacox's *Ear-Training*, (Philadelphia), Presser.

It is suggested that the work in harmony be based on such a book as Jadassohn's *A Manual of Harmony*, (New York), Schirmer.

DRAWING

TWO UNITS MAY BE OFFERED

The outline below, recently adopted by the North Central Association of Colleges and Secondary Schools, indicates the nature of the work which should be included in the two units of Drawing. While the work is not separated here into a *first* and *second year* program, the more elementary forms of each phase of the subject should be selected for the *first year*. Approximately one-third the time should be given to representative drawing and two-thirds to decorative composition, constructive and decorative design, construction and applied design.

The outline is as follows:

Pictorial.—Plant study (flowers, sprays of leaves, seeds, pods, etc.). Object study. Landscape (roof studies, buildings, etc.). Pose drawing. Composition.

Decorative Composition.—Plant forms, object study, landscape, pose.

Decorative Design.—Plant analysis (for the purpose of design). Conventionalized plant forms. Decorative units, borders, surfaces, corners, rosettes, posters, book-covers, etc. Stencils, wood-block printing. Historic ornament. Arrangement of straight lines, and of straight and curved lines. Geometric design. Lettering, illuminating. Schemes for interior decoration.

Constructive Design.—Designs for pottery, leather, metal, book-binding, furniture, cardboard construction, textiles, etc.

Crafts.—Pottery, leather work, metal work, book-binding, furniture. (Choice of one or more of the above crafts.)

Applied Design.—Design applied to the crafts and to cardboard, textiles, etc.

Illustration.

Talks on history and industry of art, on civic planning, domestic architecture and decoration.

Instrumental drawing to be given as needed to meet the requirements of practical designing and construction.

Note.—Mediums used: pencil, charcoal, water colors, crayons, brush and India ink, and a combination of the pure mediums.

It is desirable to accentuate the life interest in these subjects as well as the technical achievement. Taught from the standpoint of their social interest, these topics may be made of great benefit in the adjustment of the student to social life. For example, in constructive design the problem of the house could be studied from the view-points of convenience, suitability, cost, appearance, etc. Under decorative design, schemes for the interior decoration of one or more rooms in the individual pupil's house (as planned above) could be worked out. This idea might be extended to embrace business houses, factories, etc. The pictorial composition could deal largely with the industrial occupations

of man, with sketch and pose work made tributary to this end. Complete expression is to be sought; and, whenever possible, the problem should be approached from the side of its relation to the life of the student.

For library equipment, see pages 130-131.

MANUAL TRAINING

TWO UNITS MAY BE OFFERED

A Unit in Woodworking. In the outline, given below, of a one year course in woodworking, the work has been arranged in groups. Each group contains a number of problems involving the same process. The arrangement provides for the uneven progress of the class, and the teacher is able to keep all members of the class engaged on the same type of work, although working on different objects. A number of supplementary exercises should be provided. The student may be permitted to make almost any object which involves the processes or principles of the group in which the class is working. The subject-matter is indicated under the heading "Processes."

The outline is as follows:

Group I. Giving the first use of the saw and the laying-out tools, such as the gage, try-square and rule.

Processes.—Measuring, squaring, gaging, sawing, boring, making dowel.

Problem.—Game board, counting board, laundry list, puzzle, etc.

Group II. Emphasizing the first use of the plane.

Processes.—Planing: surface, edge, to dimensions, chamfering.

Problem.—Swing-board, hat-rack, bread-cutting board, etc.

Group III. Teaching the first use of the chisel.

Processes.—Vertical chiseling, gouging, paring, sharpening chisel.

Problem.—Shelf and brush-rack, tray, sleeve-board, etc.

Group IV. Involving "form-work" and the first use of the spoke-shave.

Processes.—Bow-sawing, modeling, sand-papering.

Problem.—Coat hanger, tool handle, canoe paddle, etc.

Group V. The construction of objects by means of some form of the groove joint.

Processes.—Housing, halving, nailing, carving, finishing.

Problem.—Waterwheel, test-tube rack, book-rack, flower-pot stand, loom, sled, box-trap, bracket-shelf, knife-polishing board, towel roller, etc.

Group VI. More exact work in planing in order to make a glue joint.

Processes.—Planing joints, gluing, clamping.

Problem.—Bread-moulding board, drawing board, bench-hook, etc.

Group VII. Construction by means of the mortise-and-tenon joint.

Processes.—Laying out duplicate pieces, cutting a mortise, sawing tenon, finishing.

Problem.—Stool, plant-stand, taboret, umbrella rack, table, etc.

Group VIII. Construction involving the mitre joint.

Processes.—Planing parallel edges and sides, use of mitre-box, laying out brace.

Problem.—Mitre-box, framing a picture, box, bracket, etc.

Group IX. Elementary cabinet making involving the use of panel.

Processes.—Plowing, fitting, putting on hinges.

Problem.—Sewing cabinet, music cabinet, plate-rack, screen, book-case, etc.

In taking the course outlined, the student should learn the following:

With reference to *tools*.—(1) To use the rule in measuring and dividing spaces. (2) How and when to use knife and pencil in laying out work. (3) To use dividers or compasses to draw arcs or divide spaces. (4) To use try-square to lay out work and to test work. (5) To use, adjust and sharpen jack plane and block plane. (6) When and how to use cross-cutting saw, rip saw and back saw, together with a knowledge of the distinguishing characteristics of these saws and the reasons for these differences. (7) To use and sharpen chisels. (8) To use hammer and nail set. (9) To use screw driver and countersink for setting screws. (10) To use brace and bit, and also how sizes of bits are designated. (11) How and when to use spoke-shave, file and sand-paper. (12) To use gouge. (13) To name all of the tools used.

With reference to *processes*.—(1) To make, mark and use a working corner. (2) To take proper steps in making a board a given length, width and thickness. (3) To detect direction of grain and use this knowledge. (4) To lay out and bore a hole through a board. How to bore to depth. (5) To plane a surface true. (6) To lay out and make a chamfered corner. (7) To lay out and make a rounded corner. (8) To make a "butt" joint. (9) To lay out and make properly a housed or dado joint. (10) To lay out and make properly a cross-lap joint. (11) To lay out and make properly a "mortise and tenon" joint. (12) To make a glue joint. (13) To lay out and make miter joint. (14) To construct a panel. (15) To apply simple finishes.

A Unit in Mechanical Drawing. The outline of a unit in Mechanical Drawing is given below. In all pencil drawing with instruments, great care should be taken to make sharp lines with accurate intersections. Do not delay precision till ink is used.

In the *first half year*, such as the following should be studied:

Straight lines.—Use of T-square, triangles, pencil, ruling pen, dividers, and scale; conventional lines; freehand working sketches.

Circles.—Use of compasses; center lines; cross hatching.

Tangents.—Location of centers and points of tangency.

Planes of projection.—Elementary principles of projection; projections of simple geometric figures.

Revolution of objects.—“Views” of objects in simple and inclined positions.

Developments.—Prism; cylinder; pyramid; cone.

In the *second half year*, such as the following should be studied:

Intersections.—Axes in the same plane; axes in different planes.

Isometric and cabinet drawing.

Freehand and mechanical lettering.—Placing; form; slant; spacing; stroke.

Working drawings.—Furniture.

Working drawings.—Machine parts.

For laboratory equipment, see pages 75-79.

For library equipment, see pages 131-132.

HOUSEHOLD ARTS (DOMESTIC SCIENCE AND ART)

TWO UNITS MAY BE OFFERED

One unit may be offered, composed of the most important portions of the two units given below, or each of the units mentioned below may be offered individually.

A Unit in Cooking. A unit in cooking should consist of (1) a study of the production, manufacture and composition of typical foods, their classification according to the food principles contained therein, and the study of the relation of these to the needs of the body; (2) a study of the fundamental scientific principles underlying the cookery processes and their application in the cooking of typical foods; (3) a study of the principles involved in the cleaning and caring for the various sorts of utensils and materials found in the kitchen.

Owing to the fact that the course in cooking has not yet been definitely standardized, a detailed outline, which represents the work done in some of the best high schools, is given. The teacher, in order to adapt it to local conditions, should judiciously make eliminations and additions, and should modify the order and emphasis.

The outline is as follows:

The Kitchen.

Recitation.—(1) Shape and size. (2) Equipment: desk and individual equipment; cupboard and group equipment; sinks and supply tables; refrigerator; burners and ranges. (3) Care of kitchen: reason for cleanliness; means of securing cleanliness; importance of order and system.

Laboratory work.—(1) List and care for articles in desk. (2) Clean and conveniently arrange cupboards. (3) Care of sinks and supply tables by different girls—housekeepers. (3) Clean refrigerator. (5) Wash dishes and towels. (6) Care for burners and ranges. (7) Read gas meter. (8) Calculate cost of gas per hour. (9) Probable cost in home.

Fuels and their Combustion.

Recitation.—(1) Kinds and classes. (2) Value of different fuels; calorific; economic; as to convenience. (3) Essentials of combustion. (4) Meaning of kindling point. (5) Products of combustion. (6) Causes and effect of incomplete combustion. (7) Need for extraordinary ventilation of kitchen. (8) Different kinds of gas, carefully studied. (9) Study matches.

Laboratory work.—(1) Note effect of closed and open mixer of burner; closed and open drafts of stoves. (2) Comparison of various methods of supplying oxygen for combustion. (3) Ventilate kitchen and class room. (4) Compare different types of burners.

Water.

Recitation.—(1) Kinds and composition. (2) Use as a cleaning agent; use as a medium in cooking; uses in the body. (3) Purification of water, including household methods. (4) Treatment of hard waters.

Laboratory work.—(1) Determine temperature of water when small bubbles begin to rise; when larger bubbles rise and break at the surface; when the whole surface is agitated. (2) Determine temperature of steam. (3) Determine temperature in double boiler. (4) Determine source of home and school water supply. (5) Soften water for cleaning. (6) Filter water through various mediums.

Fruits.

Recitation.—(1) Uses of various grades of fresh fruits. (2) Composition and value as food. (3) Processes of preparing fresh fruits. (4) Decay of fruit: cause and prevention of decay; means of destroying micro-organisms; resistance of spores. (5) Methods of preserving fruits and vegetables: sorting; cleaning; storing; drying; sterilizing; use of sugar, spices, vinegar; low temperature; cold storage; fraudulent and harmful preservatives. (6) Uses of preserved fruits. (7) Com-

parison of fresh and preserved fruits and vegetables as to cost; as to food value. (8) Food laws governing sale of fresh and preserved fruits and vegetables. (9) Reading and interpreting all food labels.

Laboratory work.—(1) Sort fruit for different purposes. (2) List fruits according to water content. (3) Cook fruits in various ways as boiling, baking, stewing, scalloping. (4) Observation of decay and mold of fruit. (5) Examination of bacteria and mold under microscope. (6) Determine conditions favoring and retarding growth of micro-organisms. (7) Can fruit and vegetables by different methods. (8) Preserve and pickle. (9) Extra sterilization. (10) Make jellies, butters, jams, etc. (11) Cook dried fruits; compare weight of fruit before and after soaking. (12) Make list of groceries which protect fruits from street dirt.

Vegetables.

Recitation.—(1) Composition. (2) Classes: according to part of plant used; according to composition; according to flavor.

Laboratory work.—(1) Preparation of different classes of vegetables—tomatoes, cabbage, potatoes, carrots, turnips, onions. (2) Different methods as boiling, steaming, stewing, creaming, baking, scalloping, sautéing. (3) White sauce for different purposes. (4) Cream soups. (5) Examine section of potato to see starch cells. (6) List ways of preventing lumping of starchy materials. (7) Determine thickening power of different starchy materials. (8) Use iodine test on different starchy foods. (9) Dextrinize flour—make toast, croutons, etc.

Starch.

Recitation.—(1) Structure and composition. (2) Various theories as to starch cell. (3) Properties: effect of moist and dry heat; effect of acids; tests for starch. (4) Digestion and value as food. (5) Method of cooking as related to composition. (6) Value of vegetables in the diet.

Cereals.

Recitation.—(1) Composition. (2) Value as food. (3) Structure. (4) Manufacture. (5) Kinds: comparative value and cost. (6) Effect of different methods of cooking on flavor and digestion. (7) Predigested cereals.

Laboratory work.—(1) Cook different kinds of cereals by different methods, using fireless cooker, if possible. (2) List amounts of different cereals that ten cents will buy; fruit combinations.

Sugar.

Recitation.—(1) Source, kinds and composition. (2) Manufacture of sugars and syrups. (3) Properties: effect of heat; moisture; dryness; effect of acid. (4) Digestion and value as food; danger of excess. (5) Adulteration of confectionery. (6) Glucose.

Laboratory work.—(1) Make syrup test with thermometer. (2) Make peanut brittle, fondant, caramel. (3) Make syrup, frosting, marquerites. (4) Make fudge, creams. (5) Figure cost of home made and purchased candies. (6) Trip to candy factory or kitchen, if possible.

Milk.

Recitation.—(1) Composition. (2) Value as food: value of casein; importance of nitrogen; nutritive value for young and adult. (3) Effect of heat: effect of high temperature in making cottage cheese and junket; relation of temperature of cooking to digestion; effect of pasteurizing and sterilizing on nutritive value and flavor. (4) Effects of acid, rennet, bacteria. (5) Care of milk: importance of cleanliness and low temperature; milk as a carrier of infection; dangers of old milk. (6) Milk as found on the market: modified, certified, condensed, and slightly condensed, malted, pasteurized, etc. (7) Factors in cost of milk. (8) Milk products. Effect of cleanliness and temperature on flavor. (9) Food laws concerning milk and milk products; inspection of dairies and wagons.

Laboratory work.—(1) Separate milk into its parts. (2) Make: butter; cottage cheese; junket; cocoa. (3) Sour milk and its uses. (4) Skimmed milk, cost and use. (5) Compare scalded and boiled milk. (6) Visit a good dairy, if possible. (7) Investigate school and home milk supply.

Cheese.

Recitation.—(1) Composition. (2) Manufacture and kinds: value of bacteria and molds in producing flavor. (3) Digestion and value as food.

Laboratory work.—(1) Make a collection of various cheeses.

Eggs.

Recitation.—(1) Composition. (2) Value as food: importance of albumin. (3) Structure. (4) Preservation: cause of decay; methods of preserving; means of testing. (5) Effect of heat and methods of cooking. (6) Economy in use of eggs; cost in different seasons; substitutes for eggs; commercial abuses. (7) Combinations: milk, eggs, cheese.

Laboratory work.—(1) Preserve eggs for winter use. (2) Test eggs for freshness. (3) Determine effect of different temperatures on eggs. (4) Cook eggs in different ways: soft and hard cooked; poached; omelets. (5) Determine cost of egg dishes at different seasons. (6) Invalid dishes. (7) Make custards, rarebits, souffles, macaroni, rice and potatoes with cheese.

Meat.

Recitation.—(1) Structure. (2) Composition and nutritive value.

(3) Selection of meat: freshness, age and condition of animal; location and cost of cuts; suitability of cut to purpose. (4) Flavor of meat; importance of extractives; ripening of meat. (5) Effect of heat: on connective tissues and walls of tubes; on juices or contents of tubes. (6) Reasons for cooking. (7) Methods of cooking: tender and tough cuts; retention of juices by searing. (8) Extraction of juices by soaking, etc. (9) Breaking up of connective tissues by cutting or grinding. (10) Removal of connective tissue by scraping. (11) Softening connective tissues by long slow cooking in water. (12) Special methods of preparing and cooking veal, mutton, pork, poultry, fish and special organs. (13) Use of left-overs: suitable combinations of flavor; dangers of food poisoning from stale meat. (14) Preservation of meat and uses of preserved meats; cold storage, canning, use of preservatives; relation of preservatives used to method of cooking. (15) Cost of meat: of different cuts and animals; at different seasons; as compared with meat substitutes. (16) Food laws concerning fresh and preserved meats.

Laboratory work.—(1) Scrape tough and tender meat to determine structure and cause of toughness. (2) Experiment with meat to determine some of the constituents and their characteristics. (3) Examine cuts of meat used: as to location of bone; amount of fatty tissue; color and grain of muscle. (4) Make drawing of animal, showing location of cuts. (5) Visit meat market, if possible. (6) Preparation of tender cuts: broil; roast. (7) Preparation of tough cuts: make meat stock, various stock soups, beef juice, beef tea; make Hamburger or loaf; make scraped meat sandwiches or meat balls; make pot roast, stew or fricassée. (8) Prepare veal, mutton, pork, poultry and fish including oysters: different methods as sautéing, roasting, stewing, frying, creaming. (9) Make dressing for roast. (10) Make sauces for serving. (11) Use left over meat in various ways, as scallop, meat pies, hash, sandwiches, etc. (12) List vegetables and seasonings that go well with different meats. (13) Cook bacon, "boiled" ham, corned beef, etc. (14) List cuts of meat according to price. (15) List foods that might be substituted for meat in the diet. (16) Meat extracts.

Fish.

Recitation.—(1) Sources and kinds. (2) How judged. (3) Dangers of old fish. (4) Preserved fish.

Laboratory work.—(1) Cook fish in various ways. (2) Sauces: hollandaise, tartar, egg.

Gelatin.

Recitation.—(1) Source. (2) Commercial preparation. (3) Properties. (4) Composition. (5) Value as food: in carrying flavor; in furnishing nourishment; function in the body.

Laboratory work.—(1) Make gelatin from meat and bone. (2) Make gelatin preparations using commercial gelatin: plain gelatin, charlottes, etc. (3) Compare fruit gelatin with "ready to use" preparations.

Legumes and Nuts.

Recitation.—(1) Composition. (2) Value as food: use as meat substitutes; digestion of.

Laboratory work.—(1) Baked beans. (2) Dried pea or lentel soup. (3) Salted almonds and peanuts. (4) Collection of nuts in natural cases.

Fat.

Recitation.—(1) Composition. (2) Value as food: function in the body; digestion of fat and foods coated with fat. (3) Kinds, source, form. (4) Structure of fatty tissue. (5) Application of heat: danger of accidents in frying, from combustion of fat; from expansion of moisture; means of preventing fat soaking; scorching of fat. (6) Economy in using fat: cost of various kinds; butter substitutes for cooking; lard substitutes. (7) Food laws concerning various fats.

Laboratory work.—(1) Render fat. (2) Determine temperature for frying cooked and uncooked materials. (3) Fry cooked and uncooked foods: use different fats. (4) Clarify fat. (5) Use partially decomposed fat for soap making. (6) Recognition of oils: olive, domestic and foreign; cotton seed oil; use of lard substitutes.

Batter and Doughs.

Recitation.—(1) Flour: composition; kinds and classes, according to composition, according to process of manufacture, according to grains used; value of the different classes, as food, for bread making. (2) Leavening agents and their action: air and steam, effect of heat, importance of elasticity of white of egg and gluten; carbon-dioxide, action of soda with sour milk, molasses, cream of tartar; action of baking powder, different kinds, effect of heat and moisture; action of yeast, different kinds, conditions favorable and unfavorable to growth, products of fermentation.

Laboratory work.—(1) Determine main constituents of flour. (2) Determine properties of gluten and make gluten balls. (3) Visit flour mill, if possible. (4) Determine tests for different oven temperatures. (5) Make sponge cake and popovers. (6) Make cereal griddle cakes, muffins, cakes, biscuits, pastry, steam puddings. (7) Determine effect of combining soda with sour milk, soda with cream of tartar and baking powder with moisture. (8) Determine suitable temperature and food for yeast. (9) Compare flours and discuss varying results in gluten content. (10) Compare various national breads.

Bread.

Recitation.—(1) Methods of making: materials used. (2) Relation to kind and condition of yeast. (3) Amount and kind of flour. (4) Reasons for kneading. (5) Relation of temperature and amount of yeast to time. (6) Baking: time and temperature; changes produced. (7) Care of bread after baked. (8) Souring and other undesirable changes in bread. (9) Comparison of home made and baker's bread: need of standard; digestion of yeast breads, quick breads and toasts, nutritive value and cost of bread.

Laboratory work.—(1) Bread making: short and long process; plain, whole wheat, graham, rye; plain and fancy rolls; bread with nuts or raisins. (2) Judge bread. (3) Visit bakery, if possible. (4) Determine cost of bread made. (5) Make toast, croutons, sandwiches, etc. (6) Macaroni and similar products. (7) Noodles.

Salads.

Recitation.—(1) Value in diet: as nourishment; as an appetizer; for furnishing variety; for the mineral of fresh fruits and vegetables; economic value. (2) Preparation: importance of freshness and crispness; importance of thorough washing of uncooked foods; importance of attractiveness in arrangement of color, form and texture, size of service, garnish; suitable combinations; considering flavor; food nutrients; digestion.

Laboratory work.—(1) Select materials for salads. (2) Prepare materials for salads: salad plants; other materials, as spring fruits and vegetables, winter fruits and vegetables, meats, nuts, eggs and cheese, left-overs; cooked French and Mayonnaise salad dressings. (3) Attractively arrange materials. (4) Determine cost of salads made. (5) An exhibition of salads.

Frozen Dishes.

Recitation.—(1) Value of frozen dishes. (2) Freezing: cause of freezing; construction of freezer; uses of fireless cooker.

Laboratory work.—(1) Care of freezer. (2) Make water ices, sherbets, ice cream and mousse. (3) Determine temperature of freezing mixture and frozen material. (4) Determine cost of desserts made. (5) Improvise freezer for individual use.

Beverages.

Recitation.—(1) Tea, coffee, cocoa, chocolate: important constituents; methods of preparation; buying, and care in the home; substitutes; physiological effects. (2) Fruit drinks: value of the diet, in sickness and health; kinds; national habits. (3) Special preparation for the sick: discussion of varying conditions and consequent needs; other methods of feeding.

Laboratory work.—(1) Make tea and coffee; compare steeped and boiled tea and coffee. (2) Make cocoa and chocolate. (3) Make fruit drinks. (4) Make preparation used in liquid and semi-liquid diet. (5) Prepare invalid's tray. (6) Broths: stimulating preparations like beef juice, meat extracts, etc.; gluten breads; liquid egg foods; plain diets; uses of milk.

Summary.

Recitation.—(1) Definition of food. (2) Classification of food according to food principles. (3) Temperature suitable for each class. (4) Digestion and assimilation of each class. (5) Value of food and food requirements: function of each class; comparative value of different foods; food value represented by calories; food requirement represented by blocks, figures or charts; food requirements for people of different ages and occupations; national and foreign investigations; dietary standards of various investigators. (6) Importance of purity of food. (7) Cost of food: comparative cost of different classes of food; cost of food at different seasons; relation of cost of food to total cost of living and to income.

Laboratory work.—(1) Review note books. (2) Make classification of foods studied: list foods according to their protein fat and carbohydrate content; list foods rich in the different kinds of mineral matter. (3) Weigh portions of food that are equivalent in total nutrients, total protein, or that yield 100 calories, or that represent a Chittenden or Atwater meal. (4) Compare cost of different cooking lessons during the year.

A Unit in Sewing. A unit in sewing should consist of (1) a study of the production and manufacture of the textile fabrics (cotton, wool, flax, silk), and methods of detecting the more usual forms of adulterations; (2) laboratory work in sewing, which should include hand-work and machine stitches as applied to household articles and clothing, the drafting of patterns for under garments and waists, and the use of commercial patterns; (3) consideration of such problems as fitness of garment to purpose, color harmonies in dress, cost of the home-made garment versus the factory-made garment, etc.

As in the case of cooking, the course in sewing has not as yet been definitely standardized, and therefore a detailed outline, which represents the work done in some of the best high schools, is given. The teacher, in order to adapt it to local conditions, should judiciously make eliminations, and should modify the order and emphasis.

The outline is as follows:

Equipment for Sewing.

Recitation.—(1) Equipment needed for hand sewing. (2) The

work box and its contents. (3) Construction and care of sewing machine. (4) Suitable chairs and tables. (5) Lighting of the room.

Laboratory work.—(1) Select and list price of individual sewing equipment. (2) Clean, oil, understand and use machine and attachments.

Use or Purpose of Clothing.

Recitation.—(1) Fulfillment of purpose: under and outer garments. (2) Suitability of clothing for various occasions, such as business, home, sick room. (3) Clothing in relation to health: effect of too little and too much clothing; effect of pressure; loosely and closely woven fabrics; non-porous clothing.

Laboratory work.—(1) Collect references to and pictures of clothing of primitive and modern times. (2) Possible trip to store to see fabrics and garments. (3) Criticize own clothing on basis of purpose. (4) Plan clothing for various seasons and occasions.

Materials Used.

Recitation.—(1) Cotton, wool, flax, silk: structure and composition; effect of heat, acids, alkalis, moisture, light; conductive and absorptive properties of the different fibers; suitability of each for under and outer clothing; manufacture of the fibers into clothing; bleaching, dyeing, printing, mercerizing. (2) Use of uncommon fibers such as jute, ramie, pineapples, cocoanut, vegetable silk. (3) Leather, fur and rubber as materials for clothing.

Laboratory work.—(1) Collect samples of raw materials. (2) Examine fibers. (3) Test samples to determine quality; fiber or fibers present, closeness of weave, adulterants. (4) Determine characteristics of warp and woof of cloth. (5) Make textile collections, illustrating the variety, quality, price, possible use and enduring probabilities, under test of elements, chemicals, and laundering of finished products of different fibers.

Selection of Materials for Class Use for Articles or Garments.

Recitation.—(1) Purpose, cost, durability. (2) Width, amount, allowing for shrinkage. (3) Color, design, weave and finish. (4) Genuineness, quality. (5) For trimming: comparative value of hand and machine work; desirable qualities for trimmings, including good edge and simple design; kinds of embroidery, laces, drawn work, etc.; harmony of material and trimming in quality and color; inappropriateness of color in trimming undergarments.

Laboratory work.—(1) Examine samples and discuss suitability. (2) Combine samples of textile fabrics to show suitable color, quality and finish for suits for different occasions and individuals. (3) Buy materials for articles to be made. (4) Select trimmings, thread, etc. (5) List cost of materials. (6) Study design in embroidery, laces and other ornamentation.

Selection of Design for Making.

Recitation.—(1) Purpose of article. (2) Form and size of individual. (3) Personality and occupation of individual. (4) Artistic effect: good lines; good color combinations; effect of light on materials of various color, quality, finish. (5) Time and money to expend on making and laundering. (6) Examine ready-made garments in forms, workmanship, material, cost. (7) In cost of production, ascertain expense, profit in labor, in equipment, in capital. (8) Determining cost to class of materials; time consumed. (9) Compare result with shop article of same cost; and cost with shop article of same quality. (10) Summarize data and comment thereon.

Laboratory work.—(1) Make design for garments. (2) Take measures. (3) Draft patterns. (4) Compare and use drafted and bought patterns. (5) Criticize designs for clothing in magazines and papers. (6) Small articles of attire, conveniences for travel, for desk, room or house; the dressing of a doll for some needy child; the making of a garment for a child in need. (These ought to be made by a group of students together, the work should be dainty and parts regarded in relation to the whole. Beauty of effect should be ensured through simplicity in design and excellence of workmanship, even with crude or commonplace materials.) (7) Process in work: pattern placed together, examined in comparison with one blocked earlier; material examined for warp, woof, lengthwise, crosswise, bias, selvage; implications, comfort in wearing, hanging well and retaining shape and laundering; discuss and illustrate types of seams and finishings, select in accordance with purpose; cut, baste, sew, finish, examine; state in writing judgment of work and disclosed needs of worker.

Cutting.

Recitation.—(1) Economy. (2) Matching pattern in cloth. (3) Arrangement of pattern with weave.

Laboratory work.—Cut out garments.

Making.

Recitation.—(1) Characteristics of good workmanship in the making of garments or articles.

Laboratory work.—(1) Keep materials and hands clean while sewing. (2) Baste, fit, stitch and finish undergarments as drawers, underwaist and skirt or gown. (3) Make suitable seams, bands, bindings, facings, corners. (4) Make tucks and put on trimmings. (5) Make shirt waist and wash dress. (6) Possibly make wool skirt.

For laboratory equipment, see pages 79-81.

For library equipment, see pages 132-136.

ECONOMICS**ONE-HALF UNIT MAY BE OFFERED**

The course in Economics should not be given earlier than the fourth year in the high school. The subject-matter should include the leading facts and principles of economics, such as division of labor, the factors of production, the laws of diminishing returns, demand and supply, value and price, wages, interest, rent and profit, credit, taxation, regulation of monopolies, and international trade. One of the better grade of texts in current use such as those by Bullock, Clark, Davenport, Ely and Wicker, Johnson, Laughlin, Walker, etc., will serve as a basis for the work, but should be supplemented with discussion and practical exercises. Written exercises are desirable.

For library equipment, see page 136.

COMMERCIAL GEOGRAPHY**ONE-HALF UNIT MAY BE OFFERED**

The object of this course is to discover the causes of the present territorial distribution of industries and of the location of lines of communication and transportation. It should treat in detail with reference to the United States, and in less detail with reference to the outlying possessions of the United States and to the most important commercial countries, the following topics: (1) the effect of surface, soil, climate, etc., that is, the physical factor in commerce; (2) the influence of race, religion, education, commercial policies, etc., that is, the human factor in commerce; (3) the effect of economic forces on production and commerce; (4) means of transportation and communication. The text-book should be supplemented by map work and assigned readings. The census of manufactures in the United States and other countries would form a valuable reference library, both for the purpose of map work and assigned readings.

It is desirable that for purposes of illustration, samples of commercial staples, lantern slides, stereopticon pictures, etc., should be freely employed; and wherever possible, that visits of inspection be made and informal lectures secured by experts in various industries. Commercial Geography should be preceded by Physical Geography, in case both are given.

For library equipment, see page 136.

BOOKKEEPING

ONE UNIT MAY BE OFFERED

The work of *one unit* in bookkeeping is the equivalent of that normally done in five eighty-minute periods a week for the school year. The student should become familiar with the meaning of double entry terms, with rules for debit and credit, and the kinds and uses of books required in accounting. He should acquire the ability to keep a single entry and a double entry set of books. Furthermore, he should become familiar with such standard business forms as bills, receipts, checks, notes, time and sight drafts, endorsements, invoices, accounts sales, deposit tickets, express receipts, bills of lading, statements of account, balance sheets, etc. He should become familiar also with the forms of business letters, beginnings and endings, etc., and should know how to write and answer telegrams and advertisements.

Bookkeeping should be done largely under the eye of the teacher as laboratory work. Good penmanship, neatness in work, accuracy and speed must all be acquired in such laboratory practice. The exercises in some of the texts which are offered by the various publishers on first lessons or elementary principles would naturally form the basis for much of such work, unless the teacher prepares his own exercise work according to a similar plan. The best evidence of good work in this subject is the character of exercise work which the student can present as a result of his laboratory practice.

A *half-unit* in bookkeeping may be offered, the work to consist of that normally done in the equivalent of five eighty-minute periods a week for one-half of the school year.

Some of the best reference works, useful especially to the teacher in charge of elementary work, are Sprague's *Philosophy of Accounts*, Hatfield's *Modern Accounting*, Lisle's *Accounting in Theory and Practice*, Dicksee's *Bookkeeping for Accounting Students*, and Cole's *Accounts—Their Construction and Interpretation*.

TEACHER-TRAINING COURSES

TWO UNITS MAY BE OFFERED

For description of the teacher-training courses, see syllabus issued by State Superintendent of Public Schools, Jefferson City, Missouri.

II

SUGGESTIONS FOR THE EQUIPMENT OF LABORATORIES**GENERAL INFORMATION**

The laboratories of a high school should be on the north side of the building, and the length of the room from east to west should be made much greater than the breadth from north to south. It is an object to have as much north light as possible. This is especially true of biological work. It is, however, not so necessary for Physics and Chemistry. In the work in Physics, sunlight may often be used to advantage and it is well to have one or two windows exposed to the sun. All laboratory rooms should be supplied with gas and water.

In the construction of a new building that is to contain a laboratory, it is important to remember that the windows should be high, running up to the ceiling; that the rooms should not be so deep from the windows on the north to the opposite wall on the south as to render it difficult for light to get readily across, and that the distance from the top of the window sills to the floor should be the same as the height of the laboratory tables. In horizontal measurement, the windows and intervening spaces of brick or stone should be about equal in width. Therefore, in horizontal measurement the north front of a laboratory should be nearly half glass. Too great care cannot be exercised to secure perfect ventilation. The temperature should be kept uniform.

The class room for the recitations in either Physics or Chemistry should be near the laboratory so that apparatus may be readily transferred to and fro. This room should have a demonstration table at least eight feet long, with both water and gas connections. If electrical power is available, this room should be wired for a lantern. Even if no lantern is available, the room should be curtained with opaque enameled cloth shades so that it can be darkened. In Missouri climate there are enough clear days to warrant special attempts to use sunlight in the class room work in Physics. One of the best arrangements is to place the demonstration table with its end toward a south window. Sunlight can then be thrown the length of the table by a mirror (heliostat) placed in the window.

But good rooms and equipment amount to little without good teachers, and the best teachers cannot do good work if opportunity be denied. Every high school in the State should have at least one person who does nothing but instruct by the laboratory method, and the larger schools should have two or more such teachers.

It is not possible for one person to meet as many classes a day in the laboratory as in the recitation room. If the quota of work for each

teacher is six recitations a day, the teacher of science should not be expected to have more than four. Careful preparation for each laboratory exercise is indispensable. In the recitation work in Physics, it is essential that carefully planned demonstration experiments be given. These will require considerable time in preparation, but it is time well spent. Few things in a class room are more pleasing and more instructive than a well executed successful experiment, and few things are more disastrous than the failure of a demonstration.

It is not economy to buy too cheap apparatus. It is always best before purchasing to submit lists to the various apparatus companies for bids.

PHYSICS

As indicated in the definition of the unit, no special list of experiments is required, each teacher being given considerable latitude in the choice of experiments. Each school should offer about fifty experiments, not attempting to make all the pupils perform the same experiments. Experiments for any particular pupil should be to some extent chosen to meet the individual needs of that pupil. In counting the required thirty experiments, the "preliminary" experiments that appear in some lists must not be included, such experiments as measurements of lengths in centimeters and inches, measurements of areas and experiments designed solely to acquaint the pupil with the fundamental units and their measurement. Each experiment should be planned to illustrate some fundamental principle of Physics and this principle should be clearly brought out.

In equipping the laboratory, it is first necessary for the teacher to choose the laboratory manual and the list of experiments to be offered. When that is done, apparatus to fit that manual and that list can be selected. Apparatus purchased from a list prepared in any other way, will be unsatisfactory, and, in all probability, will not fit the work. The experiments as given in laboratory manuals are usually planned so as to obtain the maximum use of each piece of apparatus, thus reducing the number of pieces necessary to buy. To obtain benefit of this, the apparatus must be selected to fit this plan. If several different experiments are conducted at the same time, not only is the work of the individual pupil more independent, but needless duplication of apparatus is avoided. Thus a greater variety and better grade of apparatus is rendered available.

It is impracticable to make partial lists that are satisfactory. If only a small amount of money is available for apparatus it is best to buy an equipment covering definite portions of the subject as, for example, mechanics, heat and sound, which is fairly complete as far as it goes. Future additions are not only more likely to be obtained but

can be selected more wisely. Under the instruction of the teacher, some of the necessary apparatus can be made at home. Many things can be picked up here and there that are very useful in the laboratory. For example, small scraps of different metals are useful for density or specific heat determinations. Often scrap iron that costs but little can be used in place of the more expensive large iron weights.

The following list is appended merely to give an idea of the cost of apparatus. *This list must be changed to suit the manual and the experiments given in the course.*

FOR TWELVE STUDENTS WORKING AT THE SAME TIME

MECHANICS AND PROPERTIES OF MATTER

6 30 cm. rulers with protractor on back.....	\$.18
6 meter rods, with brass tips.....	1.80
½ lb annealed iron wire, No. 24, on spool.....	.28
¼ lb spring brass wire, No. 27, on spool.....	.30
¼ lb spring brass wire, No. 24, on spool.....	.25
½ lb bare copper wire, No. 32, B. & S. gauge.....	.35
4 8 oz. spring balances, graduated in both English and metric units with flat backs, broad pointers.....	3.24
4 64 oz. spring balances, graduated in both English and metric units with flat back, broad pointers.....	2.00
6 white pine rods, straight grained, 41x½x½".....	.30
6 white pine rods, straight grained, 41x1x½".....	.36
2 sets iron weights, universal 1000 grams to 10 grams.....	3.60
4 mounted uprights 10 cm. scales, divided in mm.....	.64
12 hardwood prisms .....	.48
1 each steel bicycle balls, ¼" & ⅜" dia.....	.08
6 pulleys, wooden, cone bearing.....	2.40
3 sets rods for same .....	.19
1 steel rule, 20 cm. long, graduated in mm. & in.....	.90
1 Jolly balance, all metal	4.50
1 torsion apparatus after model of Carmen, complete with rods	12.00
1 micrometer-caliper, metric, 13 mm., friction head.....	3.00
1 vernier caliper, English and metric, inside and outside jaws, depth gauge	2.25
1 spherometer reading to 1—100 mm.....	3.00
1 "Cenco" triple beam balance complete (if a good beam balance is not available)	12.60
1 metal cylinder, iron, about 50 mm. long, 12 mm. diam., for density determinations .....	.15
1 metal cylinder, brass, about 50 mm. long, 12 mm. diam., for density determinations .....	.15

1 metal cylinder, aluminum, about 50 mm. long, 12 mm. diam., for density determinations	\$.15
2 smooth pine boards, 50x15x2 cm., for friction.....	.22
2 7" hand screw clamps, No. 14.....	.72
3 waterproof cherry blocks, 3x3x1½".....	.30
2 platform balances, Harvard trip agate bearing.....	12.00
2 sets weights, 1000 to 5 grams.....	2.15
2 sets weights, 5 to 0.01 grams.....	.40
5 waterproof loaded rectangular blocks .....	.90
1 lb sulphur rolls .....	.10
6 lead sinkers .....	.70
5 round waterproof rods, 8x½" .....	.25
4 Sp. Gr. bottles, 50 cc. approximately	1.45
4 glass "J" shaped tubes, closed at one end for Boyle's law....	2.40
2 "Y" tubes of lead.....	.36
6 lb mercury and bot.	5.25
12 small glass tumblers .....	.48
12 glass tubes, 50 cm. long, 5 mm. diam.....	.40
6 screw pinchcocks	1.08
6 ft. rubber tubing, ¼" diam. ....	.54
2 bottles, 2 liters capacity with stoppers, rubber, 1-hole.....	.60
1 condensing and exhausting pump (if better is not available)..	3.25
2 lb paraffine .....	.30
1 barometer tube, 80 cm. long, 5 mm. bore, closed at one end..	.25
1 Nicholson's hydrometer	1.20
1 jar for hydrometer, 12x2 .....	.34
2 boards for composition of forces, 58x84 cm. with ring, and pegs	3.00
2 cars for inclined plane	1.80
2 pulleys for same .....	.60
4 iron balls, 25 mm. diam., for pendulum, ground and polished..	.32
1 Pr. ivory balls, 50 grams and 150 grams.....	4.00
<hr/>	
Total for mechanics and properties of matter.....	\$100.51

HEAT

6 flasks, 125 cc., flat bottom	\$.32
3 air thermometer tubes, 2" bulb.....	.46
12 thermometers—10 to 110 c, stem scale Jena glass.....	9.60
2 linear expansion apparatus, all metal with N. P. brass tube, lever reading	4.80
5 lb shot, No. 6.....	.70
8 calorimeters, polished, N. P.....	2.88
4 Harvard apparatus "A" new style, with detachable tripod....	8.00
1 lb heavy walled glass tubing, 1 to 2 mm. internal diam.....	.60

3 iron supports, 2 rings each.....	\$.80
3 sheets brass wire gauze, 4x4".....	.21
100 grams pure paraffine for melting point determination.....	.10
2 nests beakers, No. 1 to 3.....	.80
4 Florence flasks, 12 oz. ....	.50
4 Florence flasks, 16 oz. ....	.65
4 Florence flasks, 8 oz. ....	.47

Total for heat\$ 30.89

SOUND

1 Kundt's apparatus with brass and steel rod, improved form..	\$ 3.30
1 sonometer with pulley for weights, 2 strings.....	4.50
2 annealed glass resonance tubes, open at both ends about 2.5 cm. diam., 120 cm. long, with sliding rod and piston sup- port	3.60
1 tuning fork, C 128, 10" long.....	1.80
2 tuning forks, C 256, 7 $\frac{1}{4}$ " long.....	2.00
2 tuning forks, A 426, 6 $\frac{1}{4}$ " long.....	1.26
2 tuning forks, C 512, 5 $\frac{7}{8}$ " long.....	1.26

Total for sound\$ 17.72

LIGHT

1 box to illustrate formation of images.....	\$.63
12 plane mirrors, 4x15 cm. or 2x6" .....	.84
10 double convex lenses, 10 cm. focus.....	1.00
10 double convex lenses, 15 cm. focus.....	1.00
6 lens supports .....	.60
6 screen supports .....	.42
6 pin supports .....	.42
6 Walter Smith school squares, med. ....	.36
1 double convex lens, 3.5 cm. diam., 15 cm. focus.....	.10
3 concave mirrors, brass, N. P.....	.60
3 triangular glass prisms, 4" long.....	.54
2 pieces heavy plate glass for refraction .....	.36
4 lb. paraffine candles, twelve .....	.64

Total for light\$ 7.51

MAGNETISM AND ELECTRICITY

1 lb fine iron filings	\$.15
24 steel knitting needles .....	.20
10 bar magnets, 6"	1.50
4 compasses, 40 mm. diam., needle, 3 cm. long.....	.88

3 Sq. ft. heavy zinc sheet, 1-16" thick.....	\$ 1.23
1 galvanoscope frame	1.12
12 lead strips, 1x10 cm., with wire.....	1.20
4 Sq. ft. sheet copper, No. 24.....	2.70
10 glass battery jars, 4x5".....	1.50
6 porous cups, 5x10 cm.....	.80
4 commutators	2.40
12 double connectors, brass .....	.96
¼ lb. copper wire, No. 30 D. C. C.....	.43
1 lb. copper wire, No. 20, D. C. C.....	.58
¼ lb. German silver wire, No. 30, D. C. C.....	.83
¼ lb. German silver wire, No. 24, D. C. C.....	.58
9 lb. commercial sulphuric acid and GSB.....	.70
1 slide wire Wheatstone bridge	2.70
1 set of 8 resistance spools after Hall.....	2.70
6 gravity cells, 6x8 complete.....	4.80
10 lb. copper sulphate	1.00
2 resistance boxes, 0.1 to 40 ohms, guaranteed accurate to ½ of 1 per cent, wound with manganin wire.....	13.50
1 tangent galvanometer	4.75
2 D'Arsonval galvanometers sensitive to 18 megohms with open coil, sight and scale attachment and leveling screws....	10.00
10 empty spools for making resistance coils.....	1.00
<hr/>	
Total for magnetism and electricity.....	\$ 58.21
Total for entire Physics equipment.....	214.84

DEALERS IN PHYSICAL APPARATUS

Central Scientific Co., 345 West Michigan St., Chicago; Chicago Apparatus Co., 40-42 West Quincy St., Chicago; Wm. Gaertner & Co., 5347-9 Lake Ave., Chicago; T. W. Gleeson, 106 Sudbury St., Boston; A. W. Hall Scientific Co., 141 Franklin St., Boston; L. E. Knott & Co., 15-17 Harcourt St., Boston; C. H. Stoelting Co., 18 South Green St., Chicago. On demand, some of these firms furnish lists of apparatus to fit particular manuals. Many suggestions are also obtained by consulting their general catalogues.

CHEMISTRY

FOR TWENTY-FOUR PUPILS, TWELVE WORKING AT
ONE TIME

FIXTURES AND PERMANENT EQUIPMENT

The first cost of the laboratory equipment will depend largely upon the quality of the tables for the pupils and the amount of plumbing

Two tables should be provided, each 12 feet long, with closet room for twelve students, and working space for six at one time. A very serviceable table with a moderate amount of plumbing can be built with a lead lined trough about 4 inches wide along the central length, and sink at one end. At the lower end, the trough should be about 6 inches deep, and heavy lead weighing 4 pounds per square foot should be used. The breadth of each of these tables should be at least 4 feet, preferably 4 feet and 4 inches; the height, 36 inches. If the tables are constructed as cheaply as possible, the cost complete with plumbing and sinks will be approximately \$10 per lineal foot; i. e., about \$120 per table. A table without plumbing will cost at least \$6 per lineal foot. When first class material and workmanship are demanded, including sinks of alberene stone, the cost will be about \$16 per lineal foot. Hence \$150 to \$400 should be allowed for tables.

Very suggestive details for laboratory equipment are given by Professor E. P. Schoch in Bulletin No. 210, University of Texas, entitled *Chemistry in High Schools*.

In addition to tables, the following items should be included in fixtures and permanent equipment:

1 draft hood	\$25.00 to \$75.00
1 wall shelf for reagents, liquids and solids.....	\$5.00 to \$10.00
15 one-liter stock bottles with glass stoppers.....	3.75
40 250 cc. (8 ounce) glass stoppered bottles, ("German tinctures") for liquids used as side reagents.....	6.00
60 250 cc. (8 ounce) wide mouthed flint glass bottles for solids as side reagents	12.00
6 earthen ware slop jars	1.50
1 automatic water still	25.00
1 stock and apparatus case, if storage closet or room for apparatus is not at hand.....	50.00
3 Kipp apparatus, 1 liter.....	6.00
1 Harvard trip scale, No. 332, Eimer and Amend's Catalog C, 1913	6.00
1 set of weights, 1000 grams to 5 grams.....	2.50
1 balance for quantitative work, E. & A's Cat. No. 300.....	12.50
1 set of weights, E. & A's Cat. No. 506, 1 gram to 200 grams...	2.00
1 siphon barometer	8.00
1 blast lamp	2.00
1 bellows, foot, Fletcher's, 7 inch.....	4.50
1 Hoffman electrolysis apparatus, E. & A. 4244.....	4.50
1 frame for metric system	2.00

(A chart called the International Metric System can be obtained from the Bureau of Standards, Washington, free of charge. It is worth framing.)

1 induction coil for automobile use.....	\$ 4.50
1 chart, periodic classification of the elements.....	1.25
2 burettes, Mohr's, for pinch cock, 50 c. c.....	1.25
2 burettes, Geissler's with glass cock, 50 c. c.....	1.85
1 burette clamp, Lincoln's .....	.50
3 sets of cork borers, 3 in set.....	.90
1 magnet .....	.20
2 magnifying glasses	1.50
1 ozone tube, E. & A. 4916.....	2.00

Total for fixtures and general equipment.....\$340 to \$645

If the class work is to include demonstrations by the teacher, a small lecture table and special apparatus should be provided and the sum of \$50 to \$100 added for this.

APPARATUS MORE OR LESS PERMANENT *

30 nests of beakers, 2½, 4, and 7 ounces, plain Bohemian.....	
30 blowpipes, jeweler's, 8 inch.....	
6 dozen flint glass, wide mouthed bottles, 4 ounce.....	
18 flint glass, wide mouthed bottles, 16 ounce.....	
24 Bunsen burners with air regulator.....	
8 dozen corks, 7-8 inch.....	
4 dozen corks, 11-16 inch.....	
12 dozen corks, assorted	
18 nests of Hessian crucibles, "threes".....	
4 dozen 1 1-4 inch porcelain crucibles.....	
24 50 cc. graduated cylinders	
3 dozen German porcelain evaporating dishes, each 2½ and 3½ inch diameter	
12 lead dishes, 2 inch.....	
24 round files, 3 inch	
24 three-cornered files, 3 inch.....	
24 packages of filter paper, 4 inch.....	
30 flasks, best Bohemian, 4 ounce.....	
30 flasks, best Bohemian, 8 ounce.....	
30 flasks, best Bohemian, 16 ounce.....	
3 dozen German glass funnels, 2½ inch.....	
24 pairs steel forceps, 5 inch.....	
24 gas bottles, 8 ounce.....	
50 rubber stoppers, two holes, to fit gas bottles.....	
5 pounds glass tubing, 1-8 and 3-16 inch bore.....	

*These items are not priced as there is considerable variation in prices. A dealer in laboratory supplies will submit an estimate.

2 pounds glass rods, 1-8 inch diameter	
2 quires test paper, litmus and turmeric.....	
24 mortars, 2½ inch	
4 feet platinum wire	
30 2 ounce retorts with stoppers, best Bohemian.....	
48 feet ¼ inch bore rubber tubing.....	
48 feet 3-16 inch bore rubber tubing.....	
30 tin sand baths, 5 inch	
4 hand scales, 6 inch beam.....	
4 sets weights, 0.1 gram to 50 grams.....	
24 test tube racks	
36 dozen test tubes, 6 inches by 5-8 inch.....	
24 test tube brushes	
3 dozen watch glasses, 2 inch.....	
24 squares blue glass	
48 hard glass test tubes, 6 inch.....	
6 lamp tips	
24 filtering stands, 1 arm, 2 holes.....	
2 dozen iron wire triangles.....	
24 pneumatic troughs, made by fitting half gallon or gallon crock with metal shelf	
30 retort stands	
1 package filter paper, 10 inch.....	
Total cost, without freight	\$200 to \$250

CHEMICALS

As the chemicals required will vary somewhat with different textbooks, the list recommended by the text selected should be provided. A very complete list with prices as given in Dr. Schoch's bulletin, referred to above.

SUMMARY OF EQUIPMENT

Fixtures and permanent equipment.....	\$650.00 to \$300.00
Apparatus more or less permanent	200.00
Chemicals	80.00
Total, at least	\$580.00

MAINTENANCE

The yearly cost of "apparatus more or less permanent," which must be replaced on account of breakage, will be approximately.....	\$60.00
The yearly cost of chemicals, approximately.....	40.00
Total annual expenditure	\$100.00

DEALERS IN CHEMICAL APPARATUS

Apparatus and supplies may be obtained from the following firms: Eimer and Amend, 205-211 Third Ave., New York City; Wm. Gaertner and Co., 5345-5349 Lake Ave., Chicago; E. H. Sargent and Co.; 143-145 Lake Street, Chicago; Henry Heil Chemical Co., 212-214 South Fourth Street, St. Louis; Scientific Materials Co., Pittsburgh, Pa.; Central Scientific Co., 345 West Michigan Street, Chicago; Kewaunee Manufacturing Co., Kewaunee, Wis. (laboratory furniture), Leonard Peterson & Co., 1240-1248 Fullerton Ave., Chicago (laboratory furniture); L. E. Knott Apparatus Co., Boston, Mass.; Bausch and Lomb Optical Co., Rochester, N. Y.; Woldenberg and Schaar, 387 Wabash Ave., Chicago; C. H. Stoelting Co., 121 North Green Street, Chicago; Max Kohl, Chemnitz, Germany; Drs. Peters and Rost, Chaussee Strasse, Berlin, Germany.

GENERAL BIOLOGY, BOTANY AND ZOOLOGY

FOR TWELVE PUPILS WORKING AT THE SAME TIME

APPARATUS

6 compound microscopes, from \$20 to \$30 apiece....	\$120.00 to \$180.00
2 laboratory tables, with drawers, 96 inches long, 36 inches wide, 29 inches high, heavy white pine, oiled top.....	20.00
12 pairs scissors, fine	6.00
12 scalpels	3.00
12 pairs forceps, medium fine, straight points.....	4.80
24 dissecting needles	1.00
6 section razors	6.00
12 dissecting lenses, one inch focus (or reading glasses 2½ inches in diameter)	12.00
1 balance, with weights	4.25
2 gross glass slides, 3x1 inches.....	2.00
4 ounces cover glasses, ¾ inch square.....	3.20
24 Syracuse watch glasses	1.25
24 pipettes, with rubber bulbs .....	.75
2 pounds glass tubing, assorted sizes.....	1.50
1 lot large flat dishes, glass or porcelain.....	....
24 Mason fruit jars, quart.....	2.00
24 test tubes .....	.38
1 lot guarded bristles .....	....
1 galvanized iron waste can, with cover.....	1.25
1 lot battery jars, large .....	....

REAGENTS AND CHEMICALS

10 pounds formalin	2.50
1 gallon alcohol, 95 per cent	4.00

1 quart absolute alcohol	\$ 1.90
1 pound ether .....	.85
1 pound mercury	1.50
2 gallons distilled water .....	....
1 pound glycerine .....	.50
1 pound turpentine .....	.15
½ pound cedar oil .....	.75
3 ounces balsam, in xylol .....	.60
1 pound glacial acetic acid .....	.50
1 pound sulphuric acid .....	.30
1 pound hydrochloric acid .....	.15
1 pound nitric acid .....	.50
½ pound picric acid, crystals.....	.75
½ pound corrosive sublimate .....	.60
1 pound chloroform .....	.75
1 pound caustic potash .....	.40
½ pound potassium cyanide, fused lumps.....	.45
1 ounce iodine, resubl .....	.60
½ ounce methyl green .....	.40
6 ounces haemalum, solution .....	.60
3 ounces acid carmine, solution.....	.70
½ ounce eosin, powder .....	.45
1 ounce pith, for sectioning .....	.10

All of the above are list-prices, except those for compound microscopes, which are special prices for schools.

Although all of the articles given in the above lists are recommended, nevertheless good work can be done with a smaller equipment. In the average school much will depend upon the teacher's ingenuity in devising substitutes for apparatus at little or no expense. Aquaria for keeping aquatic forms alive in the laboratory are necessary and for this purpose large battery jars will be found satisfactory. One dozen tumblers, some wide mouthed bottles with corks for water or sand cultures, a few thistle tubes, some rubber stoppers, rubber tubing, beeswax or paraffine, and some bibulous paper will be found helpful additions for any work in plant physiology. A few stoneware saucers will also be found indispensable for work on the germination of seeds. Insect cages may be readily made of wire or cotton netting placed over pans or trays filled with earth in which the plants, used as food by the insects, are growing. These, and many other contrivances, for making observations and experiments upon living animals and plants in the laboratory are of the greatest value, as the chief stress should be laid upon this phase of the instruction.

DEALERS IN ANIMALS FOR CLASS WORK

Brimley, H. H. & C. S., Raleigh, N. C. (live and preserved material); Marine Biological Laboratory Supply Dept., Woods Hole, Mass. (preserved marine material); McCurdy, B. F. & Co., 312 E. 65th Place, Chicago (live material); Powers, H. H., Station A, Lincoln, Neb. (living hydra, etc., and miscellaneous slides).

ZOOLOGICAL SUPPLY DEPARTMENT OF THE UNIVERSITY OF MISSOURI

The Department of Zoology of the University of Missouri has frequently received from teachers in all parts of the State requests for dissection and demonstration material to be used in teaching this subject. These requests have been answered with references to dealers in such supplies, or with simple directions regarding the collection and preservation of the material which could be found near at home. But to secure supplies in small quantities from dealers at a distance was both troublesome and expensive, while the teachers were often unable, or had not the time, to obtain living or properly preserved material from the local fauna. Accordingly, a plan for establishing a zoological supply department at the University was submitted to superintendents of accredited schools. Since only favorable replies were received and since similar plans have been successfully carried out in other states, it was decided to establish the department.

The department is prepared to furnish to the accredited schools of the state living and preserved materials from the local land and freshwater fauna, and also the marine forms that are ordinarily used. In addition to the forms used for student dissection, simple museum specimens and microscopic preparations may be secured. Furthermore, explanation of methods of collecting and preserving material will be made, in order to assist the schools in obtaining material locally. All supplies will be furnished *at cost*, and the schools will have the further advantage of low transportation charges and prompt delivery.

This department is not in operation between June 1st and October 1st. The current price list and further information may be obtained by addressing the Zoological Supply Dept., 509 South 9th St., Columbia, Mo.

DEALERS IN LABORATORY APPARATUS AND SUPPLIES FOR BOTANY AND ZOOLOGY

Bausch and Lomb Optical Co., Rochester, N. Y. (microscopes and supplies); Cambridge Botanical Supply Co., Cambridge, Mass. (general botanical equipment, preserved material and fresh marine algae); Drury, Miss E. M., 45 Munroe Street, Roxbury, Mass. (slides and botanical material); Eimer & Amend, 205-211 Third Ave., N. Y. (general apparatus, supplies, and reagents); Ernest Leitz, 30 E. 18th St., N. Y. (microscopes and supplies); Marine Biological Laboratory, Supply Department, Woods Hole, Mass. (marine material); Spencer Lens Co., Buffalo, N. Y.

(microscopes and supplies); Western Biological Supply Co., Station A, Lincoln, Neb. (zoological material and microscopic preparations).

PHYSIOLOGY

The apparatus and chemicals necessary for the accurate measurement and observation of the activity of such organs as the heart, respiratory system, muscles, nerves, etc., and for the chemical study of the blood, the digestive process, etc., can be had at a comparatively small cost. The lists given below contain some things for which the ingenious teacher may himself make very effective substitutes at little cost, save time and his own labor. The minimum outfit for effective work is as follows:

GENERAL EQUIPMENT

Student tables, size of top about 34x54, height 34 inches....	} \$100
Stools, two to each table.....	
Gas, water, and electric connections for an electric clock....	
General chemical table and shelves.....	
General supply of chemicals	
Electric clock, or simple wall pendulum, beating seconds, with mercury contact, and electric connections.....	

GENERAL APPARATUS FOR DEMONSTRATION

1 mercury manometer and blood pressure outfit.....	5.00
1 set of test lenses for the eye.....	6.00
1 color wheel, or a small electric motor, with set of color discs	7.00
Assorted glass tubing	1.00
Assorted rubber tubing	1.50
Assorted corks	1.00
1 shellac outfit	1.00

SPECIAL SETS OF APPARATUS AND CHEMICALS

FOR EACH GROUP OF FOUR STUDENTS WORKING TOGETHER

For physiological experiments.

1 table, size about 34x54x34 inches.....	\$10.00 to \$ 20.00
2 stools, height 20 inches.....	1.00
1 recording drum and clockwork.....	24.00
1 induction coil	7.00
1 platinum stimulating electrode	1.00
2 dry batteries .....	.50
2 porcelain base (knife edge), electric keys.....	.30
1 muscle lever	1.15
1 muscle clamp	1.00
100 weights, 10 gram, lead.....	.30
1 heart lever, of straw .....	.00

1 heart lever holder (or use muscle lever holder).....	\$ 1.15
1 signal magnet (electric, for the time circuit).....	1.05
1 tuning fork, 100 double vibrations a second.....	1.00
2 iron stands, heavy base (chemical stands will serve).....	2.00
2 burette clamps, simple .....	.60
2 burette clamps, universal .....	.80
100 sheets glazed paper, 6x20 inches.....	.50

For physiological chemical experiments.

1 set chemical apparatus, containing 6-inch file, 100 filter papers, 4-inch funnel, bunsen burner, 100 c. c. graduated cylinder, 4-inch flat bottom evaporating dish, 300 c. c. flask, test tube rack and dozen test tubes, set of 6 beakers, 100° centigrade thermometer, costing in all about.....	6.00
1 set student chemicals containing starch, dextrine, dextrose, acetic acid, nitric acid, hydrochloric acid, picric acid, ammonia, caustic soda or potash, sodium chloride, magnesium sulphate, ammonium sulphate, calcium chloride, copper sulphate, sodium potassium tartrate, glycerine, pepsin, ptyalin, pancreatin and fibrin, costing in all about.....	6.00
1 set chemical reagent bottles	4.00

Total\$201.85

DEALERS IN APPARATUS

Harvard Apparatus Co., Back Bay P. O., Boston, Mass.; Eimer and Amend, New York City, N. Y.

DEALERS IN CHEMICALS

Mallinckrodt Chemical Co., St. Louis, Mo.; Merck & Co., St. Louis, Mo.

PHYSICAL GEOGRAPHY

FOR TWELVE PUPILS WORKING AT THE SAME TIME

GENERAL EQUIPMENT

A collection of common rocks and minerals.....	\$ 2.50
Sun board	6.00
Six self-registering maximum and minimum thermometers.....	3.65
Sight compass	5.65
Rain gauge	2.75
Wind vane (made by students)	
Anemometer (made by students).....	
Mason's hygrometer	5.00
Globe, 12 inch	6.00

- Physical maps of the continents and the United States, in spring roller case 29.35
- Daily and monthly weather maps. (The daily maps may be obtained from the nearest weather bureau station, the monthly from the Weather Bureau at Washington, D. C.)

TOPOGRAPHIC MAPS

Order maps from the United States Geological Survey, Washington, D. C. The topographic maps cost five cents each in lots of one hundred. The following list includes all maps necessary. The number of copies of each map needed will depend upon the number of pupils in the class and the plan of work. There should be one map for each two students, whether working in one section or more than one. If the class is divided into groups and each group studies different sheets, fewer copies of each will be needed.

Simple plain or plateau: Thibodeaux, Louisiana; Fargo, North Dakota; Bowling Green; Ohio; Coude, South Dakota; Chicago, Illinois.

Simple mountain ridge: Harrisburg, Pennsylvania; Delaware Water Gap, New Jersey-Pennsylvania.

Plain with young valleys: Wilson, New York; Fostoria, Ohio; Dublin, Ohio.

Mountains with shallow valleys: Shasta, California; Harper's Ferry, Virginia-Maryland.

Plains with well-defined valleys: Palmyra, Missouri; Wicomico, Maryland; Olivet, South Dakota.

Dissected mountains: Mt. Marcey, New York; White Mts., New Hampshire.

Dissected plains: Lancaster, Wisconsin; Versailles, Missouri; Hazard, Kentucky; Ironton, Ohio-Kentucky.

Past mature plains: Clinton, Missouri; Nevada, Missouri; O'Fallon, Missouri.

Plains with hills and valleys: Warrenton, Virginia; Frederick, Maryland.

Plains with hills: Eagle, Wisconsin; Oswego, New York; Baldinsville, New York.

Plains with mountain ridges and valleys: Harrisburg, Pennsylvania.

Maps of valleys: Map of alluvial valley of the Mississippi River; Kansas City, Missouri; Wheeling, West Virginia-Ohio; Niagara Falls, New York; Harpers Ferry, Virginia-Maryland; Albany, New York; Charleston, West Virginia; Hinton, West Virginia; Sullivan, Missouri; Marseilles, Illinois; St. Louis, Missouri; East and West sheets. Map of the United States showing the Mississippi, Potomac, Delaware and other river basins.

Ponded rivers: Norwich, Connecticut; Perch Lake, Michigan.

Drowned valleys: New London, Connecticut; Saybrook, Connecticut; Washington, D. C.; New York City, New York.

River deposits (flood plains): Marshall, Missouri; St. Louis, Missouri-Illinois; Kansas City, Missouri; Thibodeaux, Louisiana; Gibson, Louisiana; The Alluvial Valley of the Mississippi River.

Maps of recently drained lake bottoms or recently uplifted sea bottoms: Fargo, North Dakota-Minnesota; Chicago, Illinois; Fostoria, Ohio; Camden, New Jersey; Edenton, North Carolina; Trent River, North Carolina.

Wind deposits: Kingsley, Kansas; Brown's Creek, Nebraska; Campe Clark, Nebraska; Provincetown, Massachusetts.

Glacial deposits: Moraines: Eagle, Wisconsin; Charleston, Rhode Island; Brooklyn, New York; Plainfield, New Jersey. Drumlins: Oswego, New York; Baldwinsville, New York; Boston, Massachusetts; Sun Prairie, Wisconsin. Sand and gravel plains: Jonesville, Wisconsin; Plainfield, New Jersey; Great Egg Harbor, New Jersey; Lynn, Massachusetts; Boston Bay, Massachusetts; Sandy Hook, New Jersey.

The following maps illustrate some of the erosive effects of glaciers, waves of seas and lakes:

U-shaped valleys: Leadville, Colorado (the high valleys); Watkins, New York; Hammondsport, New York.

Fjords: Methow, Washington; Stehekin, Washington; Juneau, Alaska.

Lakes: Webster, Massachusetts; Franklin, New Jersey; Paradox Lake, New Jersey; Plymouth, Massachusetts, Minneapolis, Minnesota.

Shore cliffs: Sandy Hook, New Jersey; San Francisco, California; Boston Bay, Massachusetts.

Volcanic deposits: Volcanic Cones: Mt. Shasta, California; Lassen Peak, California; Mt. Tabor, New Mexico.

Lava plains and plateaus: Modoc Lava Beds, California; Bisuka, Idaho.

Laccolite mountains: San Rafael, Utah; Henry Mountains, Utah.

Good illustrative maps: Dunlap, Illinois; Kanawha Falls, West Virginia; Hinton, West Virginia; Ocean, West Virginia; Chattanooga, Tennessee; McMinnville, Tennessee; Cleveland, Tennessee; Suwanee, Tennessee; Ringgold, Tennessee; Belchertown, Massachusetts; Northampton, Massachusetts; Springfield, Massachusetts; Charleston, West Virginia; Nichols, West Virginia; Echo Cliffs, Arizona; Tooele Valley, Utah; Kaaterskill, New York; Mt. Marcy, New York; Catskill, New York; Disaster, Nevada; Granite Range, Nevada; Harrisburg, Pennsylvania; Pine Grove, Pennsylvania.

CHARTS

Atlantic Ocean.

Sailing charts, A, B, C, D, each.....\$.50

General charts of the coast, Nos. 6, 7, 376, 11, 19, 21, each....\$	.50
Coast charts, Nos. 105, 106, 120, 121, each.....	.50
Pacific Ocean.	
Sailing charts, S. ....	.50
General charts of the coast, Nos. 550, 6,000, 8,100, 8,200, each..	.50
Harbor chart, No. 5581 .....	.50
One set tide tables, Atlantic Coast; U. S. Coast and Geodetic Survey .....	.25
One set tide tables, Pacific Coast; U. S. Coast and Geodetic Survey .....	.25
Weather maps, Order from U. S. Weather Bureau, St. Louis, Missouri.	

ADDITIONAL APPARATUS

The following additional apparatus, very desirable, but not essential, should be added as soon as possible.

Relief maps, by Prof. Harry Keeler, of the Englewood High School, Chicago, to illustrate typical regions in the different stages of development, making them especially valuable in Physical Geography. It will be noticed that the prices are about 50 per cent of those formerly charged for reliable maps.

SUBJECT	Size over all, inches	Horizontal Scale	Vertical Scale	Price Net	EXAMPLE
Niagara.....	38"x15.5"	1 in.=1 mile	4 to 1	\$20.00	{ Water Falls, and Stream Erosion
Shasta.....	22.5"x17"	1 in.=1 mile	True Scale	17.50	{ A Young Volcanic Mountain
Crater Lake....	20"x16"	1 in.=1 mile	2 to 1	17.50	A Crater
Grand Canyon.	20.5"x17.5"	1 in.=4 miles	2 to 1	17.50	{ Weathering and Stream Erosion
Marshall, Mo...	21"x17"	1 in.=1 mile	2 to 1	17.50	A Graded River
Ottawa, Ill.....	21"x17"	1 in.=1 mile	2 to 1	17.50	{ Work of Young Stream
Teachers Model	24.5x15.5"			15.00	

Slated globe 10 in. with moveable semi-circle.....\$	3.00
Series of lantern slides to illustrate the phenomena of Physical Geography. Selected and prepared by Wallace W. Atwood, of the University of Chicago, and Jane Perry Cook, of the Chicago Normal, with descriptive text for each slide. (Circular sent upon application.) Complete set, 550 slides, each..	.40

College bench lantern with objective, condensing lens and slide carrier. (Illuminant extra depending upon kind wanted)....	\$27.00
Helidon invented by Prof. J. F. Morse, of the Medill High School, Chicago, an adjustable appliance for demonstrating the apparent path of the sun through the sky at equinox and solstice times with reference to the horizon and zenith of an observer at any latitude. (Circular upon application.) Net..	10.00
Soil thermometer	1.10
Barograph (Duty free).....	20.00
Thermograph (Duty free).....	20.00

AGRICULTURE

FOR A CLASS OF SIXTEEN PUPILS

MATERIAL TO BE COLLECTED BY TEACHER AND STUDENTS AT THE BEGINNING OF THE YEAR

- . 1 bushel clean sand.
 - 1 bushel sandy loam soil.
 - 1 bushel clay.
 - 8 quarts leaf mold (well rotted).
 - 1 bushel rich soil for use in growing house plants.
- Samples of commercial fertilizer, with analysis and prices given.
- Collection of economic seeds. (These may be secured free of U. S. Department of Agriculture. In ordering this collection, address U. S. Dept. of Agriculture, Seed Laboratory, Washington, D. C. When ordering send \$1.50 to Mackall Bros., 9th and H. Streets, N. E., Washington, D. C. This is to pay for the tray and vials used in packing the collection. Notify the Department that the money has been sent to pay for tray and vials.)
- Collections of economic seeds prepared by teacher and students.
- Seeds of the following trees: oak, walnut, hickory, hazel, apple, pear, peach, cherry, plum, etc.
- Cereals: corn, wheat, oats, rye, barley, rice, etc.
- Grasses and clovers: red clover, alsike, white clover, alfalfa, timothy, millet, orchard grass, blue grass, Johnson grass, Bermuda grass, cowpeas, redtop, etc.
- Common weeds: purslane, morning glory, Jamestown weed, cocklebur, cheat, ragweed, horseweed, etc.

EQUIPMENT TO BE PURCHASED

2 doz. student lamp chimneys,	\$ 1.50
2 doz. wide-mouthed bottles, per doz. 26c, 1 oz.....	.52
2 doz. wide-mouthed bottles, per doz., 45c, 6 oz.....	.90
4 thistle tubes, 10c.....	.40

1 lb. glass tubing, one-fourth inch.....	\$.44
4 thermometers, chemical, centigrade, at 60c.....	2.40
6 doz. test tubes, 8x1	3.00
1 "Cenco" trip scale.....	6.65
1 set weights	1.65
1 Babcock milk and cream tester.....	5.50
8 shallow pans, at 35c.....	2.80
4 glass funnels, 3-in., at 12c.....	.48
2 sieves, 20 mesh	} 6.45
2 sieves, 60 mesh	
1 sieve, 100 mesh	
1 lb. glass rods—small .....	.50
1 lb. glass tubing—small diameter .....	.50
8 tripod microscopes, 44c	3.52
1 soil augur	3.00
2 percolation cylinders	3.50
2 evaporation cylinders	5.00
2 graduated cylinders, 65c, 100 cc.....	1.30
3 blast lamps, gasoline, \$2.75.....	8.25

 \$58 26

(The apparatus listed above when purchased in one order will cost about \$51.00, transportation charges prepaid.)

- 4 Mason's pint fruit jars.
- 4 doz. 4-in. flower pots with saucers.
- 3 doz. 6-in. flower pots with saucers.
- 16 heavy dinner plates.
- 16 panes of glass, 8x11.
- 1 tiling spade.
- 1 table, 3½ ft. x 12 ft.
- 1 suitable case for storing apparatus.

At least an acre of ground should be provided.

APPARATUS NOT REQUIRED, BUT VERY DESIRABLE

2 soil thermometers	\$2.50
1 dissecting microscope	9.50
1 bucket sprayer	5.00

The apparatus may be purchased of the Central Scientific Company, Chicago, Ill.; the W. M. Welch Mfg. Co., Chicago, Ill., 100 Lake St., or any other standard scientific apparatus company.

MANUAL TRAINING

A UNIT IN WOODWORKING

MINIMUM INDIVIDUAL EQUIPMENT

1 bench and vise	\$ 8.75
1 Bailey No. 4 smooth plane.....	1.60
1 2' two fold rule .....	.12
1 12" back saw	1.10
1 No. 162 Stanley marking gauge.....	.15
1 No. 20 Stanley try square.....	.20
1 sloyd knife 2½" blade .....	.18
1 ¼" firmer chisel .....	.30
1 1" firmer chisel .....	.40
1 spoke shave, Stanley No. 64.....	.12
1 maple bench hook .....	.18
1 bench brush .....	.25
<hr/>	
<i>Total</i>	\$ 13.35

MINIMUM GENERAL EQUIPMENT

1 Disston No. 7 or Jennings' crosscut saw, 10 points, 24".....	\$ 1.25
1 Disston No. 7 or Jennings' rip saw, 8 points, 24".....	1.25
1 bit brace, 8" sweep	1.00
1 Miller's Falls hard drill, No. 2.....	1.30
1 keyhole saw .....	.40
1 14" turning saw with frame.....	.90
1 screw driver, 4" blade.....	.18
1 screw driver, 6" blade .....	.20
2 6" wing dividers .....	.30
2 6" T bevels .....	.40
2 adz eye claw hammers, 10 oz.....	1.00
6 ¾" gouges, outside ground	3.00
1 set auger bits	3.00
3 scrapers .....	.25
3 nail sets, assorted .....	.20
4 10" hand screws	2.70
6 7" hand screws	2.50
1 mounted oil stone .....	.75
1 steel oiler .....	.10
1 mounted grindstone	6.00
<hr/>	
<i>Total</i>	\$26.68

MEDIUM INDIVIDUAL EQUIPMENT

1 bench and vise	\$ 10.00
1 jack plane, Bailey No. 5.....	1.80
1 block plane, Stanley No. 220.....	.45
1 2' two fold boxwood rule.....	.12
1 12" back saw	1.10
1 2½" mallet .....	.15
1 marking gauge, Stanley No. 162.....	.15
1 try square, 6" blade, Stanley No. 20.....	.20
1 6" wing dividers .....	.15
1 sloyd knife, 2½" blade.....	.18
1 screw driver, 4" blade .....	.18
1 ¼" dowel bit .....	.20
1 ½" dowel bit .....	.30
1 ¼" firmer chisel .....	.30
1 ½" firmer chisel .....	.35
1 1" firmer chisel .....	.40
1 spoke shave, Stanley No. 64.....	.12
1 maple bench hook .....	.18
1 bench brush, bristle .....	.25
Total	<u>\$16.58</u>

MEDIUM GENERAL EQUIPMENT

3 Disston No. 7 or Jennings' crosscut saws, 10 points, 24"....	\$ 3.75
3 Disston No. 7 or Jennings' rip saws, 8 points, 24".....	3.75
1 set auger bits, 3-16" to 1", inclusive.....	3.00
1 Miller's Falls hand drill, No. 2.....	1.30
1 keyhole saw .....	.40
1 14" turning saw .....	.90
1 screw driver, 6" blade .....	.20
4 6" T bevels .....	.80
3 nail sets, assorted .....	.20
4 10 oz. adz eye claw hammers.....	2.00
3 bit braces, 8" sweep	3.00
6 ¾" gouges, outside ground	3.00
1 set J. S. Addis carving tools	4.00
1 framing square	1.10
4 scrapers .....	.35
6 10" hand screws.....	4.00
6 7" hand screws	2.50
2 carpenter's steel clamps, 48".....	3.60
2 mounted oil stones	1.50
2 steel oilers .....	.20

1 mounted grindstone\$ 9.00

Total\$48.55

VERY COMPLETE INDIVIDUAL EQUIPMENT

1 bench and vise, with lockers.....\$ 16.50
 1 Stanley "Bed Rock" jack plane, No. 605..... 2.10
 1 Stanley block plane, No. 15..... .80
 1 2' two fold rule12
 1 12" back saw 1.10
 1 Disston No. 7 or Jennings' crosscut saw, 22", 10 points.... 1.25
 1 Disston No. 7 or Jennings' rip saw, 22", 8 points..... 1.25
 1 ratchet bit brace, 8" sweep..... 1.50
 1 10 oz. adz eye claw hammer..... .50
 1 2½" mallet15
 1 Stanley marking gauge, No. 165..... .28
 1 Stanley try square, 6" blade..... .20
 1 6" T bevel20
 1 6" wing dividers15
 1 sloyd knife, 2½" blade18
 1 screw driver, 4" blade18
 1 ¼" dowel bit20
 1 ½" dowel bit30
 1 ¼" firmer chisel30
 1 ½" firmer chisel35
 1 1" firmer chisel40
 1 spoke shave, Stanley No. 64..... .12
 1 nail set08
 1 maple bench hook18
 1 bench brush (bristle)25

Total\$ 28.64

VERY COMPLETE GENERAL EQUIPMENT

1 Disston No. 7 or Jennings' crosscut saw, 8 points, 26".....\$ 1.50
 1 Disston No. 7 or Jennings' rip saw, 6 points, 26"..... 1.50
 1 set auger bits, 3-16" to 1", inclusive..... 3.00
 1 Clark's expansive bit 1.00
 1 Miller's Falls hand drill No. 2..... 1.30
 3 keyhole saws, assorted80
 2 14" turning saws with frames..... 1.80
 1 Langdon mitre box with saw..... 9.35
 1 drawing knife, 8" blade95
 1 framing square, rustless 1.10
 1 Stanley universal plane with bits..... 12.00

6 1" gouges, outside ground	\$ 3.60
6 ¾" gouges, outside ground.....	3.00
1 set J. S. Addis carving tools, No. 12.....	5.75
6 scrapers, assorted .....	.50
6 brad awls, assorted .....	.25
1 Bailey No. 8 jointer.....	3.00
6 10" hand screws with iron screws.....	4.80
6 8" hand screws with iron screws.....	4.40
4 carpenter's steel clamps, 48"	7.20
2 oil stones, mounted	1.50
2 steel oilers .....	.20
1 mounted grindstone, treadle attachment.....	12.00

Total\$ 80.50

In making an estimate of the cost of an equipment, about 10 per cent should be added to the estimates given here. This will be needed for extra and unforeseen wants.

DEALERS

Schroeter Bros., Hardware Co., 717-719 Washington Ave., St. Louis, Mo.; Simmons Hardware Co., St. Louis, Mo.; Orr & Lockett Hardware Co., 71-73 Randolph St., Chicago, Ill.; E. H. Sheldon & Co., 320 North May St., Chicago Ill.; Hammacher, Schlemmer & Co., 4th Ave. & 13th St., New York City; The Chas. A. Strelinger Co., 96 Bates St., Detroit, Mich.

A UNIT IN MECHANICAL DRAWING

FOR A CLASS OF TWENTY PUPILS WORKING AT THE SAME TIME

20 sets of drawing instruments	\$ 60.00
20 T-squares (cherry)	8.00
20 Xylonite Triangles, 45, 7 in.....	8.00
20 Xylonite Triangles, 30x60, 7 in.....	7.00
20 white pine drawing boards, 20x25 inches.....	18.00
20 architects' triangular scales	8.50

Each pupil should possess the following:

1 dozen thumb tacks .....	.05
1 pencil and ink eraser.....	.05
1 sponge eraser .....	.10
1 sketch book, for pencil.....	.10
1 pencil, soft, finest grade, No. 2.....	.10
1 pencil, 4 H, for mechanical drawing.....	.05
1 bottle Higgins' black drawing ink.....	.25

Drawing paper in large sheets, size 19x24, of good quality, for mechanical drawing, may be had from 2 to 5c per sheet.

DEALERS IN DRAWING MATERIAL

The following firms are among those which are reliable: Eugene Dietzgen Co., Chicago; F. Weber & Co., St. Louis; A. S. Aloe Co., St. Louis; Keuffel & Esser Co., St. Louis.

HOUSEHOLD ARTS (DOMESTIC SCIENCE AND ART)

FOR SIXTEEN PUPILS WORKING AT THE SAME TIME

COOKING

The following list of equipment is intended to be suggestive. The prices quoted are only approximate. In the case of such things as desks, refrigerator, supply cabinet and cupboards, cheaper equipment may be secured, if necessary. Detailed information with regard to equipment may be found in *Equipment for Teaching Domestic Science* by Helen Kinne, Whitcomb & Barrows, Huntington Chambers, Boston, Mass. The price of this book is eighty cents.

Gas range	\$ 21.00
Gasoline stove, with oven (if there is no gas)	10.00
16 individual stoves, each .....	.75
8 desks, each 5 ft. long, each	25.00
16 stools, each .....	.50
4 sinks, each	4.00
Refrigerator	25.00
Supply cabinet	10.00
Grocery cupboard	5.00
China cupboard	10.00
4 sets scales, each	3.00
4 microscopes, each	20.00
8 dishpans, each .....	.25
8 tin boxes for flour, each .....	.08
8 tin boxes for sugar, each .....	.08
8 plates for soap and sapolio, each .....	.15
100 test tubes	1.00
Litmus paper	
Box of corks	
Box of matches .....	.03
8 thermometers, each .....	.30
4 shallow biscuit pans made to fit the oven .....	.40
8 biscuit cutters, each .....	.05
Roasting pan .....	.25
2 deep iron kettles .....	.75
2 wire baskets, each .....	.10
2 draining spoons .....	.06

Large grater	\$.05
2 large stew kettles, each .....	.50
2 large double boilers, each .....	.25
4 ice cream freezers, 1 qt.....	5.00
2 doz. fruit jars	1.50
2 doz. jelly glasses	2.00
8 muffin rings	2.00
Meat grinder	1.25
Coffee pot (percolator)	3.50
Flour sifter .....	.10
Tea kettle .....	.75
6 small tin buckets .....	.30
Large sauce pan .....	.25
Carving knife .....	.25
Tea pot .....	.25
2 scrubbing brushes, each.....	.15
40 dish cloths, linen, $\frac{1}{4}$ yard in length.....	2.00
50 dish towels, linen, 1 yard in length.....	7.50
16 sets of apparatus, as follows:	
tablespoon	\$.06 2-3
2 teaspoons, each .....	.03 1-3
salt spoon .....	.05
wooden spoon .....	.05
fork .....	.07
spatula .....	.25
paring knife .....	.05
measuring cup .....	.08
mixing bowl .....	.50
large baking dish.....	.35
ramekin .....	.10
plate (porcelain) .....	.10
pie tin .....	.03
clover egg beater .....	.10
egg whip .....	.02
rolling pin .....	.30
molding board .....	.10
deep cake and bread pan.....	.10
2 sauce pans, each .....	.25
cover for sauce pans .....	.05
frying pan .....	.08
wire strainer .....	.10
double boiler .....	.25

SEWING

This list, as the preceding one, is intended to be suggestive. The prices quoted are only approximate. In the case of tables, cabinets and teacher's desk, cheaper equipment may be secured.

4 tables, each 10 ft. in length, each.....	\$16.00
16 chairs, each .....	.75
2 cabinets, each	10.00
1 teachers desk	15.00
1 mirror	6.00
4 sewing machines, each	25.00
16 sets as follows:	
12-inch ruler	\$.05
yard ruler, metal edge.....	.20
pair scissors .....	.75
tape measure .....	.05
pin cushion .....	.10
emory .....	.05
work box .....	.10

III

SUGGESTIONS FOR THE EQUIPMENT OF LIBRARIES

GENERAL INFORMATION

In accordance with the law approved March 19, 1901, it is made mandatory upon the district boards of directors to set aside, out of the levy for incidental purposes, not less than five nor more than twenty cents per pupil enumerated in the district each year, which shall be spent, under the direction of the board, in purchasing books, the first hundred of which shall be from a list selected by the State Library Board. (R. S. 1909, Sec. 8186.)

In addition to this provision, the qualified voters in each school district (outside of an incorporated city) have the power, at the annual meeting, by a majority of the votes cast, to vote such a sum as they may deem proper, not to exceed two mills on the dollar, for the purchase of books for a district library. (R. S. 1909, Sec. 8196.)

In cities containing 1,000 and less than 100,000 inhabitants, the Board of Education has power "to establish and maintain a library for the use of the public school district therein," and to appropriate the following sums therefor: 20,000 and under 100,000 inhabitants, \$2,500; 5,000 and under 20,000, \$500; 1,000 and under 5,000, \$250. (R. S. 1909, Sec. 10871.)

This is, in brief, the state of the law in Missouri in reference to the school library. The list of books spoken of in the first paragraph, which may be obtained from the State Superintendent, contains largely books suited to the lower grades. It is with the hope of stimulating the growth of the high school libraries throughout the State and directing that growth in the right direction that these suggestions are made.

Books can generally be purchased to the greatest advantage through some large retail book shop. The firm of A. C. McClurg, 215 Wabash Avenue, Chicago, is recommended for domestic books and that of G. E. Stechert, 151 West 25th St., New York, for foreign books. Low discounts may usually be secured from local book-sellers. It is seldom of advantage to deal with the publisher direct. *If a large order is sent, a discount of about thirty per cent from the prices named in the following lists may be expected.* The discount will vary on different books and on some no discount can be given. In writing for books, one should be particular to state *exactly* what is wanted, giving author, title, edition, and publisher.

When the books arrive, they should be compared with the order and the bill, and entered in an accession book. This book, which can be ob-

tained already ruled from the Library Bureau, 156 Wabash Ave., Chicago, is intended to be an exact record of the books in the library and is ruled for author, title, publisher, date, size, binding, house from which purchased and cost. This record is simply intended for business purposes. It is not a catalogue in any sense. One line is given to each volume and each line is numbered consecutively. Each volume, then, has a separate number which should be entered in some stated place on the volume itself, such as the foot of the page following the title.

Before the books are circulated, they should be marked indelibly in several places with the name of the library. A rubber stamp for this purpose can be had for a few cents. For example, the title page, the fifty-first page and the last page should be marked. It is a good idea to have a book plate printed and inserted on the inside cover of each book. The leaves of all uncut books should be cut.

If it is possible, a separate room should be set apart for the library. This room should be made attractive and kept open all day long as a study room. If there is no fund from which to pay a librarian, the library should be placed in charge of one of the teachers, who should be held responsible for it. Good aids for the person in charge of the library are Dana's *Library Primer*, Stearns' *Essentials in Library Administration*, Hitchler's *Cataloging for Small Libraries*, Kroeger's *Aids in Book Selection and Binding for Small Libraries* and Brown's *Mending and Repair of Books*. *The Library Primer*, which costs \$1.00, can be obtained of the Library Bureau, Chicago. The other books in the list, which cost 15c each, can be obtained of The American Library Association, 78 E. Washington St., Chicago.

Every means should be used to encourage pupils to read. They should be referred to definite books frequently and should be shown the books by the teacher. Supplementary reading in moderate quantities should be assigned. Pupils should be permitted to take the books home. During the vacation when the school house is closed, the books should be removed to the home of some one who will care for them and issue them as desired by the residents of the district.

If the library is large enough to warrant the employment of a librarian, some one with a special library training should be employed. It is just as important that the librarian should have a special education as it is for the teacher. If a whole year cannot be given to the study, the librarian should take at least a course at some summer school of library economy.

Every library of over 1,000 volumes should be catalogued on cards. To be effective this work must be done by trained cataloguers. Card cases and other supplies can be had of the Library Bureau. A model catalogue can be secured from the Superintendent of Documents, Washington, D. C., by sending for a copy of the *A. L. A. Catalogue of 8000*

Volumes for a Popular Library, (price, \$1.00). This is a most carefully selected list and is very useful as an aid in the selection of books. Printed cards of all the books listed can be obtained from the Library of Congress at a cost of two cents for each different card and one-half cent for each duplicate card. The *Handbook of Card Distribution*, which will be sent gratis, should be secured from the Library of Congress.

The Missouri Library Commission, Jefferson City, Missouri, will be glad to correspond with anyone who wishes suggestions regarding the establishment or administration of school libraries.

The following lists of books are suggested:

GENERAL REFERENCE BOOKS

The prefix * indicates that the book is especially valuable.

*Webster's <i>New International Dictionary</i> , (Springfield, Mass.) Merriam	\$ 12.00
* <i>New International Encyclopedia</i> , (22 Vols.), (N. Y.) Dodd, Mead	92.50
Lippincott's <i>New Gazetteer</i> , Philadelphia	10.00
*Rand-McNally's <i>Indexed Atlas of the World</i> , (2 Vols.)	18.50
Bartlett's <i>Familiar Quotations</i> , (Boston) Little	3.00
Stephen & Lee's <i>Dictionary of National Biography</i> , (22 Vols.), Macmillan	93.50

ENGLISH

The prefix * indicates that the book is especially valuable.

FOR REFERENCE

LANGUAGE AND RHETORIC

Abbott, E. A., <i>Shakespearian Grammar</i> , Macmillan	\$ 1.50
Alden, R. M., <i>Introduction to the Study of Poetry</i> , Holt	1.25
Bradley, H., <i>The Making of English</i> , Macmillan	1.00
Bright & Miller, <i>Elements of English Versification</i> , Ginn .....	.80
Fowler, N. W. and F. G., <i>King's English</i> , Oxford Univ. Press	1.75
*Genung, J. F., <i>Working Principles of Rhetoric</i> , Ginn	1.40
*Greenough, B., and Kittredge, G. L., <i>Words and their Ways in English Speech</i> , Macmillan	1.10
*Hill, A. S., <i>Principles of Rhetoric</i> , New Edition, American Book Co.	1.20
Jespersen, O., <i>Growth and Structure of the English Language</i> , (N. Y.) Stechert	1.00
Johnson, C. F., <i>Forms of English Poetry</i> , American Book Co. .	1.00
*Krapp, G. F., <i>Modern English</i> , Scribner	1.25

Lounsbury, T. R., <i>History of the English Language</i> , Holt.....\$	1.12
Nesfield, J. C., <i>English Grammar Past and Present</i> , Macmillan	1.10
Skeat, W. W., <i>An Etymological Dictionary of the English Language</i> , (1910), Oxford University Press.....	9.50
*Skeat, W. W., <i>Principles of English Etymology</i> , (2 Vols.), Clarendon	5.35
Smith, L. P., <i>The English Language</i> , Holt.....	.50
Sweet, H., <i>New English Grammar</i> , (2 parts), Clarendon Press	2.65
*Whitney, W. D., <i>Essentials of English Grammar</i> , Ginn.....	.75
Wyld, H. C., <i>The Growth of English</i> , Dutton.....	1.00
Wyld, H. C., <i>Historical Study of the Mother Tongue</i> , Dutton.	2.00

BOOKS ON LITERATURE.

Adams, O. F., <i>Dictionary of American Authors</i> , Houghton....	3.00
Alexander, W. J., <i>Introduction to Browning</i> , Ginn.....	1.00
Bates, Arlo, <i>Talks on the Study of Literature</i> , Houghton.....	1.50
Bradley, A. C., <i>Shakespearean Tragedy</i> , Macmillan.....	3.25
Bronson, W. D., <i>English Poems</i> , (4 Vols.), University of Chicago Press	6.00
Brooke, S. A., <i>English Literature from the Beginning of the Norman Conquest</i> , Macmillan	2.50
Child, C. G., <i>Early Plays</i> , (Riv. Ser.), Houghton.....	.40
Corson, H., <i>Introduction to Shakespeare</i> , Heath.....	1.50
Corson, H., <i>Introduction to the Study of Robert Browning's Poetry</i> , Heath	1.50
Dixon, W. M., <i>Tennyson Primer</i> , Dodd, Mead.....	1.25
Dowden, E., <i>Shakespeare: His Mind and Art</i> , Harper.....	1.75
<i>English Men of Letters</i> , ed. by J. Morley, (39 Vols.), Harper	29.25
Fairchild, A. H. R., <i>The Making of Poetry</i> , Putnam.....	1.50
Furnivall and Munro, <i>Shakespeare: Life and Work</i> , Cassell..	.35
Gayley, C. M., <i>Classic Myths in English Literature</i> , Ginn.....	1.50
Gayley, C. M., <i>Representative English Comedies</i> , Macmillan..	1.50
Gosse, E. W., <i>History of Eighteenth Century Literature</i> , Macmillan	1.50
Gummere, F. B., <i>Old English Ballads</i> , (Athen. Press) Ginn..	.80
Gummere, F. B., <i>The Oldest English Epic</i> , Macmillan.....	1.10
Maccallum, M. W., <i>Shakespeare's Roman Plays and their Background</i> , Macmillan	2.50
Manly, J. M., <i>English Poetry</i> , Ginn.....	1.50
Manly, J. M., <i>English Prose</i> , Ginn.....	1.50
Minto, W., <i>Manual of English Prose Literature</i> , Ginn.....	1.50
Newcomer, A. G., <i>Twelve Centuries of English Prose and Poetry</i> , Scott, Foresman	1.75
Page, C. H., <i>Chief American Poets</i> , Houghton.....	1.75

Pollard, A. W., <i>English Miracle Plays</i> , Clarendon Press.....	\$ 1.90
Pound, L., <i>The Periods of English Literature</i> , University of Nebraska Press .....	.75
Raleigh, W., <i>Shakespeare</i> , Macmillan .....	.50
Raleigh, W., <i>Wordsworth</i> , (London) Arnold	2.00
Ryland, T., <i>Chronological Outlines of English Literature</i> , Mac- millan	1.75
Saintsbury, G., <i>History of Elizabethan Literature</i> , Macmillan.	1.75
Saintsbury, G., <i>History of Nineteenth Century Literature</i> , Mac- millan	1.50
Schelling, F. E., <i>The Elizabethan Drama</i> , (2 Vols.), Houghton	7.50
Stedman, E. C., <i>American Anthology</i> , Houghton.....	3.00
Stedman, E. C., <i>Victorian Anthology</i> , Houghton.....	3.00
Taine, H., <i>History of English Literature</i> , Holt.....	1.75
Thayer, W. R., <i>Best English Plays</i> , Ginn.....	1.40
Tisdell, F. M., <i>Studies in Literature</i> , Macmillan.....	.90
Tolman, A. H., <i>Questions on Shakespeare</i> , University of Chi- cago Press	Part I, 75c; Part II 1.00
Ward, T. H., <i>English Poets</i> , (4 Vols.), Macmillan.....	4.00
Wendell, B., <i>Literary History of America</i> , Scribner.....	3.00

ENGLISH CLASSICS

Addison, J., <i>Spectator</i> , Macmillan.....	1.50
Arnold, M., <i>Essays in Criticism</i> , (2 Vols.), Macmillan.....	3.00
Austen, J., <i>Works</i> , (5 Vols.), Putnam.....	2.50
Bacon, <i>Essays</i> , ed. by West, Putnam.....	1.00
Blackmore, <i>Lorna Doone</i> , Ginn.....	.65
Boswell, <i>Life of Johnson</i> , (2 Vols.), (Everyman's Lib.), Dutton70
Browne, Sir T., <i>Religio Medici and Urn Burial</i> , (Everyman's Lib.), Dutton35
Browning, R., <i>Complete Works</i> , (Cambridge ed.), Houghton..	3.00
Bryant, W. C., <i>Poetical Works</i> (Household ed.), Appleton....	1.50
Bunyan, J., <i>Pilgrim's Progress</i> , (Everyman's Lib.), Dutton...	.35
Burns, R., <i>Poems, Songs and Letters</i> , (Globe ed.), Macmillan	1.75
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*Nicolay, <i>Abraham Lincoln: A Short Life</i> , Century Co.....	2.40
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As the lists given above are special in character, the following general reference works of value might be mentioned as desirable in connection with history courses:

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<i>New International Encyclopedia</i> , (22 Vols.), Dodd, Mead (or other good standard encyclopedia such as the new Britannica).	92.50
Ploetz, <i>Epitome of Ancient, Mediaeval, and Modern History</i> , 2d ed. by Tillinghast, Houghton, Mifflin.....	3.00
Report of the Committee of Seven, <i>The Study of History in Schools</i> , Macmillan50
<i>Statesman's Year Book</i> , pub. annually, Macmillan Co.....	3.50

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The most essential books are indicated by the prefix ** and present the minimum library which should be possessed by a secondary school. Books next in importance are indicated by the prefix * and every effort should be made to secure these as well as the remaining volumes in the list.

Historical works have not been included as it is assumed that these will be selected from the list of reference works for American History. Among the books in that list special attention is called to such collections as *Old South Leaflets*, Hill's *Liberty Documents* and Macdonald's *Select Charters and Other Documents Illustrative of American History*, 1606-1898.

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**Hinsdale, Burke Aaron, <i>The American Government, National and State</i> , American Book Co.....	1.25
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* <i>Statistical Abstract of the United States</i> , (published annually by the Bureau of Statistics, Department of Commerce and Labor, Washington). Free.	
*Stimson, F. J., <i>The American Constitution</i> , (1908), Scribner..	1.25
<i>United States Civil Service Commission</i> , (Annual Report) (Washington).	
*Willoughby, W. F., <i>Territories and Dependencies of the United States</i> , (1905), Century.....	1.25
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*Wilson, Woodrow, <i>The State</i> , (1902), Heath.....	2.00
*Wilson, <i>Congressional Government</i> , (1900), Houghton.....	1.25
*Wilson: <i>Constitutional Government in the United States</i> , (1908), Lemcke	1.50
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*Homer, <i>Odyssey</i> , trans. by Butcher and Lang, Macmillan....	.80
Herodotus, with commentary by J. W. Blakesley, (2 Vols.), Macmillan	4.50
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Herodotus, translated by G. C. Macauley, (2 Vols.), (1890), Macmillan	4.50
Lucian, trans. by H. W. and F. G. Fowler, (4 Vols.), (1905), Oxford	3.50
Sophocles, <i>The Tragedies</i> , trans. by Sir George Young, (Everyman's), Dutton35
Sophocles, <i>The Tragedies</i> , edited with English notes by L. Campbell, (2 Vols.), (Oxford) Clarendon Press.....	8.00
Sophocles, <i>The Tragedies</i> , trans. by E. H. Plumptre, (1882), Geo. Routledge & Sons	1.25

<i>The New Testament in the Original Greek</i> , ed. by Westcott and Hort, (2 Vols.), Macmillan.....	\$ 4.00
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D. C. Heath & Co., <i>Methods of Teaching Modern Languages</i> , (1893), (Boston)72
Handschin, <i>The Teaching of Modern Languages in the U. S.</i> , U. S. Bureau of Education, (1913, No. 3, Whole No. 510), Free.	

(Part II contains list of works chronologically arranged on teaching of modern languages and contains also other valuable bibliographical data, pp. 107-150). Free.

Evans, *The High School Course in German*, (revised ed.), bulletin of the University of Wisconsin, University of Wisconsin, (Madison). Free.

PHONETICS

Grandgent, <i>German and English Sounds</i> , Ginn.....	\$ 2.00
Vietor, <i>German Pronunciation</i> , Heilbronn.....	.50
Vietor, <i>Wie ist die aussprache des Deutschen zu lehren?</i> Marburg .....	.20
Michaelis, <i>Abriss der deutschen Lautkunde</i> , Haberland, (Leipzig) .....	.25

DICTIONARIES, ETC.

Convenient dictionaries, smaller and cheaper than those given above in list of reference works for school library are:

James, <i>German and English Dictionary</i> , Macmillan.....	.50
Heath, <i>German and English Dictionary</i> , Heath.....	1.50
Duden, <i>Orthographisches Wörterbuch</i> , 8th ed. Leipzig, (1911) (for spelling only) .....	.40
Elster, <i>Methodische Leitfaden d. deutschen</i> , Interpunktionslehre, (Magdeburg)25

LITERATURE

Kluge, <i>Geschichte der deutschen Nationalliteratur</i>60
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REFERENCE WORKS FOR STUDENTS

Kullmer, <i>A Sketch Map of Germany</i> , (the 2 x 3 diagonal method), Kramer Co., (Syracuse, N. Y.).....	.25
<i>Aus Nah und Fern</i> , Francis W. Parker Sch. Press, (Chicago), (a quarterly magazine in German for American students).	.40
<i>Deutsches Liederbuch für Amer. Studenten</i> , Heath.....	.75

FRENCH

Most of the books mentioned as desirable are published in France. They can best be ordered through A. Picard et Fils, Libraires, No. 82, Rue Bonaparte, Paris. This is the best firm at Paris for ordering foreign books. One should always order directly from abroad, since American dealers at New York and elsewhere ask from 20 per per cent to 50 per cent more than this and other good foreign firms. Books are sent by mail or freight, and the money is forwarded by postoffice money order. The more important works are indicated by the prefix *.

GENERAL REFERENCE

*Brachet-Toynbee, <i>Historical French Grammar</i> , Clarendon Press	\$ 2.00
*Edgren-Burnet, <i>French and English Dictionary</i> , Holt.....	1.50

*Fortier, <i>Hist. de la Littérature Française</i> , Holt.....	\$ 1.00
*Hatzfield-Darmsteter, <i>Dictionary</i> , (2 Vols.), (Paris) Delagrave	40 francs
* <i>International French-English Dictionary</i> , invaluable because of its having the pronunciation of all words given in phonetic spelling, Hinds & Noble.....	\$ 3.00
*Lanson, <i>Hist. de la Lit. Française</i> , (Paris) Hachette.....	7 francs
* <i>L'Echo des Deux Mondes</i> , a monthly journal, (Chicago), A. C. Babize & Co., per year.....	\$ 1.50
<i>Le Maître Phonétique</i> , the best journal for the study of accurate speech, not only in French but in all the more important modern languages. (Address: Rue de la Madeleine, Bourg-la-Reine, Sienne, France), per year.....	7 francs
* <i>Le Petit Larousse</i> , (1 Vol.).....	6.50 francs
Matzke, <i>French Pronunciation</i> , 2d edition, is very useful, Holt	\$.25
Michaelis-Passy, <i>Dict. Phonétique Française</i> , (Paris) Le Soudier	5 francs
Nyrop, <i>Grammaire Historique de la Langue Française</i> , (2 Vols.), (1904), (Paris)	15 francs
*Parton, <i>French Parnassus</i> , Houghton, Mifflin.....	\$ 1.50
Passy, P., <i>Le Français Parlé</i> , (Leipzig) Reisland.....	2.50 francs
Passy, <i>Les Sons du Français</i> , (Paris) Didot.....	1.50 francs
*Pellissier, <i>Précis de l'Histoire de la Lit. Française</i>	4 francs
Petit de Julleville, <i>Hist. de la Langue et de la Lit. Française</i> , (8 Vols.), (Paris) Armand Colin.....	126 francs
Rambeau-Passy, <i>Chrestomathie Phonétique</i> , (Paris) Le Soudier	6 francs
<i>Revue des Deux Mondes</i> , Paris, bi-monthly, per year.....	62 francs
*Skeat's <i>Etymological Dictionary</i> , invaluable for showing the relationship between French and English words; Clarendon Press,	\$11.00

LITERATURE

A library should, of course, contain a considerable number of standard works of French literature. There are so many of value to select from that special books or authors are not listed here.

PHONOGRAPHS

One of the most desirable aids to a correct pronunciation is the phonograph. A teacher can not possibly give all the time necessary to secure good pronunciation in an average class, but this machine proves

an admirable substitute, when conscientiously and continuously used. Good companies that sell or lease phonographs and the necessary disks for the study of a modern language are The United States School of Languages, Annapolis, Md., and the International College of Languages, Putnam Building, New York. A machine with a set of elementary disks and the corresponding text can be bought for about \$45. The set of advanced records costs \$10, and a third set of difficult French words costs \$5. The same school also has sets of records for Spanish.

SPANISH

In addition to a collection of the standard authors and a phonograph with disks, the following brief list of desirable volumes may be given:

Diccionario de la Real Academia, (Madrid) Hernando....	25 pesetas
(Double the price here given if not paid in advance; postage extra.)	
Velásquez de la Cadena, <i>Diccionario Esp. Inglés</i> , (2 Vols), Appleton	\$ 6.00
Of smaller and cheaper dictionaries, Appleton's <i>New Spanish Dictionary</i> will be found usable.....	2.00
Fitzmaurice-Kelly, <i>History of Spanish Lit.</i> (For beginners, the English edition; for advanced classes, the more complete edition; translated by Bonilla y San Martín), (Madrid) España Moderna.....	10 pesetas
Hume, <i>Modern Spain</i> , (Nations Series), (London) Unwins.	\$ 1.25

Lemcke and Buechner's *Catalogue Raisonné of Spanish Literature* (New York) will be found invaluable as a guide in selecting the best Spanish books, newspapers, and periodicals.

PHYSICS

Ames, J. S., <i>Text-book of General Physics</i> , (1904), American Book Co.	\$ 1.60
Aryton, W. E., <i>Practical Electricity</i> , (1900), Cassell.....	2.00
Boys, C. V., <i>Soap Bubbles</i> , (1900), (London) S. P. C. K....	.50
Cajori, F. F., <i>History of Physics</i> , (1899), Macmillan.....	1.60
Derr, <i>Photography for Students of Physics and Chemistry</i> , Macmillan	1.40
Duff, A. W., <i>Text-book of Physics</i> , (1912), Blakiston.....	2.75
Edser, E., <i>Light for Students</i> , (1903), Macmillan	1.50
Edser, E., <i>Heat for Advanced Students</i> , (1901), Macmillan..	1.00
Everett, J. D., <i>C. G. S. System of Units</i> , (1891), Macmillan..	1.25
Forbes, G., <i>Course of Lectures on Electricity</i> , (1888), (Lon- don), Longmans	1.00

Ganot, A., <i>Elementary Treatise on Physics</i> , 17th ed., (1906), Longmans	\$ 2.50
Glazebrook, R. T., <i>Mechanics and Hydrostatics</i> , Macmillan...	2.50
Glazebrook, R. T., and Shaw, W. N., <i>Practical Physics</i> , (4th ed.), (1893), (London), Longmans.....	2.50
Hastings, <i>Light</i> , Scribner	2.50
Houston and Kennelly, <i>Elementary Electrical Series</i> , (10 Vols), <i>Magnetism, The Electric Motor, The Electric Telegraph, The Electric Telephone, Electric Street Railways</i> , etc., (New York), McGraw and Hill, per volume.....	1.00
Larden, W., <i>Electricity</i> , Longmans.....	1.75
Maxwell, J. C., <i>Theory of Heat</i> , (1897), (London), Longmans	1.50
Michelson, <i>Light Waves and their Uses</i> , University of Chicago Press	2.00
Miller, D. C., <i>Laboratory Physics</i> , (1903), Ginn.....	2.00
Nichols, E. L., <i>Laboratory Manual of Physics</i> , (Vol. 1), Macmillan	3.00
Perry, J., <i>Spinning Tops</i> , (1901), (London), S. P. C. K.....	.50
Poyser, A. W., <i>Magnetism and Electricity</i> , Longmans.....	1.50
Smithsonian, <i>Physical Tables</i> , Smithsonian Institute.....	2.00
Stewart, B., and Gee, W. W., <i>Lessons in Elementary Practical Physics</i> , (1 Vol.), (1898), Macmillan.....	1.50
Taylor, Sedley, <i>Sound and Music</i> , (London) Macmillan.....	2.25
Thomson, J. J., <i>Electricity and Matter</i> , (1904), Scribner.....	1.25
Thompson, S. P., <i>Elementary Lessons in Electricity and Magnetism</i> , (1892), Macmillan	1.40
Thompson, S. P., <i>Light, Visible and Invisible</i> , (1897), Macmillan	1.50
Tyndall, J., <i>Heat as a Mode of Motion</i> , (1895), Appleton....	2.50
Tyndall, J., <i>Sound</i> , (1895), Longmans.....	2.00
Watson, W., <i>Text-book on Physics</i> , Longmans.....	3.50
Wood, R. W., <i>Physical Optics</i> , (1905), Macmillan.....	3.50
Wright, L., <i>Optical Projection</i> , Longmans	2.25
Zahm, J. A., <i>Sound and Music</i> , (1892), McClurg.....	3.00

CHEMISTRY

Armitage, F. A., <i>History of Chemistry</i> , (1906), Longmans...	1.60
Bailey, E. H. S., <i>Sanitary and Applied Chemistry</i> , (1906), Macmillan	1.40
Bird, R. M., <i>Modern Science Reader</i> , Macmillan.....	1.10
Dobbin, L., and Walker, J., <i>Chemical Theory for Beginners</i> , Macmillan .....	.70
Duncan, R. K., <i>The Chemistry of Commerce</i> , (1907), Harper	2.00
Faraday, M., <i>Chemical History of a Candle</i> , Harper.....	.85

Holleman, A., <i>Organic Chemistry</i> , Wiley	\$ 2.50
Kahlenberg and Hart, <i>Chemistry and Daily Life</i> , Macmillan..	1.25
Lassar-Cohn, <i>Chemistry in Daily Life</i> , Lippincott.....	1.50
Meyer, E. von, <i>History of Chemistry</i> , (1898), Macmillan....	4.50
Newth, G. S., <i>Text-book of Inorganic Chemistry</i> , (1894), Longmans	1.75
Olsen, <i>Quantitative Analysis</i> , Van Ostrand.....	4.00
Ostwald, W., <i>Conversations in Chemistry</i> , (1905), (N. Y.), Wiley	1.50
Picton, H. W., <i>Story of Chemistry</i> , (1892), (London) Isbister	.85
Ramsay, W., <i>Gases of the Atmosphere</i> , (1896), Macmillan...	1.50
Reychler, A., <i>Outlines of Physical Chemistry</i> , Macmillan....	1.00
Roscoe, H. E., <i>Life and Experiences</i> , (1906), Macmillan....	4.00
Shenstone, <i>The Methods of Glass Blowing</i> , Longmans.....	1.50
Smith, A., <i>General Inorganic Chemistry</i> , (1906), Century....	2.25
Snyder, H., <i>Chemistry of Plant and Animal Life</i> , (1903), Macmillan	1.40
Snyder, H., <i>Chemistry of Soils and Fertilizers</i> , (1899), (Easton) Chemical Pub.	1.50
Sutton, <i>Volumetric Analysis</i> , Blakiston	5.50
Thompson, S. P., <i>Michael Faraday: Life and Work</i> , (1898), Macmillan	1.25
Thorpe, T. E., <i>Essays in Historical Chemistry</i> , Macmillan..	4.00
Treadwell-Hall, (Vol. I), <i>Qualitative Analysis</i> , Wiley.....	3.00
Treadwell-Hall, (Vol. II), <i>Quantitative Analysis</i> , Wiley....	4.00
The laboratory manuals of Allan, Miss Blanchard, and Vulté on Household and Applied Chemistry will afford sugges- tions for supplementary experiments that may be assigned to the more rapid workers in the class.	

GENERAL BIOLOGY, BOTANY AND ZOOLOGY

GENERAL BIOLOGICAL REFERENCES

Bateson, W., <i>Mendel's Principles of Heredity</i> , Putnam.....	3.50
Bower, F. O., <i>The Origin of a Land Flora</i> , (1908), Macmil- lan	5.50
Darwin, C., <i>Origin of Species</i> , (1892), Appleton.....	2.00
Davenport, E., <i>Principles of Breeding</i> , (1908), Ginn.....	2.50
Hertwig, R., <i>General Principles of Zoology</i> , (1897), Holt....	1.60
Hodge, C. F., <i>Nature Study and Life</i> , (1902), Ginn.....	1.50
Jordan and Kellogg, <i>Evolution and Animal Life</i> , Appleton...	2.50
Kerner, A., von M., <i>Natural History of Plants</i> , tr. by F. W. Oliver, (2 Vols.), (1895), Holt.....	15.00

Metcalf, M. M., <i>Outline of the Theory of Organic Evolution</i> , (1904), Macmillan	\$ 2.50
Punnett, R. C., <i>Mendelism</i> , (1909), (N. Y.) Wiltshire Book Co. ....	.50
Romanes, G. J., <i>Darwin and After Darwin</i> , (2 Vols.), Vol. I— <i>The Darwinian Theory</i> , (1892), (Chicago) Open Court..	2.00
Sedgwick, W. T. & Wilson, E. B., <i>General Biology</i> , (2d ed.), (1895), Holt	1.75
Thomson, J. A., <i>Heredity</i> , (1908), Putnam.....	3.50
Wallace, A. R., <i>Darwinianism</i> (1890), Macmillan.....	1.75
Walter, H. E., <i>Genetics</i> (1913), Macmillan.....	1.50
The teacher should have access to the following:	
Lloyd, F. E., and Biglow, M. A., <i>The Teaching of Biology in the Secondary School</i> (1904), Longmans.....	1.50
<i>Nature-study Review: A Journal Devoted to all Phases of Nature-study in Elementary Schools</i> , 41 North Queen St., Lancaster, Pa. Per Vol. (6 nos.).....	1.00

BOTANY

ELEMENTARY TEXT AND REFERENCE BOOKS

Atkinson, G. F., <i>Elementary Botany</i> , rev. ed., (1905), Holt..	1.50
Atkinson, G. F., <i>Botany for High Schools</i> , (1910), Holt.....	1.25
Bailey, L. H., <i>Lessons with Plants</i> , (1898), Holt.....	1.10
Bailey, L. H., <i>Garden Making</i> , Macmillan.....	1.00
Barnes, C. R., <i>Outlines of Plant Life</i> , (1900), Holt.....	1.10
Bergen, J. Y., <i>Elements of Botany</i> , rev. ed., (1904), Ginn....	1.30
Bergen, J. Y., and Davis, B. M., <i>Principles of Botany</i> , (1906), Ginn	1.50
Buchanan, E. D. and R. E., <i>Household Bacteriology</i> , (1913), Macmillan	2.25
Caldwell, O. W., <i>Handbook of Plant Morphology</i> , (1904), Holt	1.00
Coulter, J. M., <i>A text-book of Botany</i> , (1906), Appleton.....	1.25
Coulter, J. M., <i>Plants—A text-book of Botany</i> (1901), Appleton	1.25
Coulter, J. M., Barnes, C. R., and Cowles, H. C., <i>A Text-book of Botany</i> , (1910), American Book Co.....	3.50
Duggar, B. M., <i>Fungous Diseases of Plants</i> , (1909), Ginn....	2.00
Leavitt, R. G., <i>Outlines of Botany</i> , (1901), American Book Co.	1.00
Lipman, J. G., <i>Bacteria in Relation to Country Life</i> , 2nd ed., (1909), Macmillan	1.50

MacDougal, D. T., <i>Experimental Plant Physiology</i> , (1898), Holt	\$ 1.00
Peirce, G. J., <i>A Text-book of Plant Physiology</i> , (1903), Holt	2.00
Pinchot, G., <i>A Primer of Forestry</i> , Bul. 24, Bureau of Forestry, (Washington)	
Robinson, B. L., and Fernald, <i>Gray's New Manual of Botany</i> , (7th edition), (1908), American Book Co.....	2.50
Schimper, A. F. W., <i>Plant Geography</i> , tr. by Fischer, (1903), Oxford Press	12.75
Strasburger, E., Schenck, H., Jost, L., and Karsten, G., <i>A Text-book of Botany</i> , 4th Eng. edition, translated by W. H. Lang, (1912), Macmillan	5.00

ADDITIONAL TEXTS, FLORAS, AND APPLIED WORKS

The following should be added to the above list, if possible:

Andrews, E. F., <i>Botany All the Year Round</i> , (1903), American Book Co.	1.00
Atkinson, G. F., <i>College Botany</i> , (1905), Holt.....	2.00
Atkinson, G. F., <i>Studies of American Fungi: Mushrooms—Edible, Poisonous, etc.</i> , (1900), (Ithaca) Andrus & Church	3.00
Bailey, L. H., <i>Survival of the Unlike</i> , (1896), Holt.....	2.00
Bailey, L. H., <i>Plant Breeding</i> , (1906), Macmillan.....	1.00
Bergen, J. Y., <i>Foundations of Botany</i> , Ginn.....	1.50
Britton, N. L., <i>N. A. Trees</i> , (1908), Holt.....	7.00
Campbell, D. H., <i>Mosses and Ferns</i> , (1905), Macmillan.....	4.00
de Candolle, <i>Origin of Cultivated Plants</i> , (1906), Appleton...	2.00
Chamberlain, C. J., <i>Methods in Plant Histology</i> , (2nd ed.), (1905), Chicago University Press	2.25
Conn, H. W., <i>Agricultural Bacteriology</i> , (2nd ed.), (1910), (Philadelphia) Blakiston	2.50
Darwin, C., <i>Insectivorous Plants</i> , (1892), Appleton.....	2.00
Darwin, C., <i>Power of Movement in Plants</i> , (1892), Appleton.	2.00
Darwin, C., <i>Cross and Self Fertilization in the Vegetable Kingdom</i> , (1895), Appleton.....	2.00
Duggar, B. M., <i>Plant Physiology</i> , (1911), Macmillan.....	1.50
Farmers' Bulletins, U. S. Dept. of Agr., Washington, D. C., (free).	
Freeman, E. M., <i>Minnesota Plant Diseases</i> , Minnesota Botanical Survey, (1905), (St. Paul).	
Ganong, W. F., <i>The Living Plant</i> , (1913), Holt.....	3.50
Gifford, J., <i>Practical Forestry</i> , (1902), Appleton.....	1.20
Goebel, K., <i>Outlines of Classification and Special Morphology</i> , (Oxford) Clarendon Press.....	5.25

Hard, M. A., <i>Mushrooms</i> , (1908), (Kirkwood, Mo.) Author	\$ 4.75
Jordan, E. O., <i>A Text-book of General Bacteriology</i> , (1909), Saunders	3.00
Lubbock, J., <i>Flowers, Fruits and Leaves</i> , (1886), Macmillan..	1.25
Stevens, W. C., <i>Introduction to Botany</i> , (1906), Heath.....	1.50
Stevens, W. C., <i>Plant Anatomy</i> , (2nd ed. rev.), (1910), Blakiston	2.00
Stevens, F. L., and Hall, J. G., <i>Diseases of Economic Plants</i> , (1910), Macmillan	1.50
Tubeuf and Smith, W. G., <i>Diseases of Plants Induced by Cryptogamic Parasites</i> , (1897), Longmans.....	5.50
Underwood, L. M., <i>Our Native Ferns and Their Allies</i> , (1900), Holt	1.00
Underwood, L. M., <i>Moulds, Mildews and Mushrooms</i> , (1899), Holt	1.50
Vines, H. S., <i>Students' Text-book of Botany</i> (1895), Macmillan	3.75
Many bulletins of the Bureau of Plant Industry, U. S. Dept. of Agriculture, Washington, D. C., are extremely valuable in high school work and should be obtained when possible.	

ZOOLOGY

ELEMENTARY TEXTS AND REFERENCE BOOKS

Holmes, S. J., <i>The Biology of the Frog</i> , (1906), Macmillan..	1.60
Jordan, D. S., and Kellogg, V. L., <i>Animal Life: A First Book of Zoology</i> , (1900), Appleton.....	1.20
Jordan, D. S., and Heath, H., <i>Animal Forms: A Second Book of Zoology</i> , (1902), Appleton.....	1.10
Jordan, D. S., Kellogg, V. L., and Heath, H., <i>Animals</i> (consisting of <i>Animal Life</i> and <i>Animal Forms</i> bound in one volume), (1903), Appleton	1.80
Jordan, D. S., Kellogg, V. L., and Heath, H., <i>Animal Studies: A Text-book of Elementary Zoology</i> , (1903), Appleton..	1.25
Jordan, D. S., and Price, G. C., <i>Animal Structures: A Laboratory Guide Designed to Accompany Animal Studies</i> , (1903), Appleton .....	.50
Linville, H. R., and Kelly, H. A., <i>A Text-book in General Zoology</i> , (1906), Ginn	1.50
Needham, J. G., <i>General Biology</i> , (1910), Comstock.....	2.00
Parker, T. J., and W. N., <i>Practical Zoology</i> , (1908), Macmillan	2.60
Pratt, H. S., <i>A Course in Invertebrate Zoology</i> , (1902), Ginn	1.25

Pratt, H. S., <i>A Course in Vertebrate Zoology</i> , (1905), Ginn..\$	1.50
Sedgwick, W. T., and Wilson, E. B., <i>General Biology</i> , (1895), Macmillan	1.75
Smallwood, W. M., <i>A Text-book of Biology</i> , (1913), Lea & Febiger	2.75
Thomson, J. A., <i>The Story of Animal Life</i> , Scribner.....	1.50
Thomson, J. A., <i>The Science of Life</i> , (1899), (N. Y.) Stone	1.25

ADDITIONAL TEXTS AND REFERENCE BOOKS

The following books should be added, if possible, to the above list:

Davison, A., <i>Mammalian Anatomy, with Special Reference to the Cat</i> , (1903), Blakiston.....	1.50
Hegner, R. W., <i>College Zoology</i> , (1912), Macmillan.....	2.60
Hertwig, R., ed. by J. S. Kingsley, <i>A Manual of Zoology</i> , (1912), Holt	3.00
Hornaday, W. T., <i>Taxidermy and Zoological Collecting</i> , (1891), Scribner	2.50
Hough, T., and Sedgwick, W. T., <i>The Human Mechanism</i> , Ginn	2.40
Kellicott, W. E., <i>The Social Direction of Human Evolution</i> , Appleton	1.25
Kingsley, J. S., <i>Comparative Anatomy of Vertebrates</i> , (1912), Blakiston	2.25
Lubbock, J., <i>On the Senses, Instinct and Intelligence of Ani- mals, with Special Reference to Insects</i> , (Internat. Sci. Ser.), (1888), Appleton	1.75
Marshall, C. E., <i>Microbiology</i> , (1912), Blakiston.....	2.50
Parker, T. J., and Haswell, W. A., <i>A Text-book of Zoology</i> , (2 Vols), (1910), Macmillan.....	9.00

BOOKS ON SPECIAL SUBJECTS

Insects and Spiders

Benton, F., <i>Honey Bee</i> , U. S. Dep't of Agriculture, Division of Entomology, New Ser., Bulletin No. 1.....	.15
Emerton, J. H., <i>Spiders, Their Structure and Habits</i> , (1890), Whidden	1.50
Folsom, J. W., <i>Entomology, with Special Reference to its Biological and Economic Aspects</i> , (1906), Blakiston.....	3.00
Holland, W. J., <i>The Butterfly Book</i> , (1899), Doubleday, Page	3.00
Holland, W. J., <i>The Moth Book</i> , (1903), Doubleday, Page...	4.00
Howard, L. O., <i>The Insect Book</i> , (1902), Doubleday, Page..	3.00
Howard, L. O., <i>Mosquitoes</i> , (1901), McClure.....	1.50

Kellogg, V. L., <i>American Insects</i> , (1905), Holt.....	\$ 5.00
Lubbock, J., <i>Ants, Bees and Wasps</i> , (International Science Ser.), (1882), Appleton	2.00
Miall, L. C., <i>Natural History of Aquatic Insects</i> , (1895), Macmillan	1.75
Peckham, G. W., and E. G., <i>Wasps, Social and Solitary</i> , (1905), Houghton	1.50
Riley, C. V., <i>Directions for Collecting and Preserving Insects</i> , (1892), Smithsonian Institute .....	.25
Scudder, S. H., <i>Butterflies: Their Structure, Changes and Life Histories</i> , (1889), Holt.....	1.50

Crustacea, Worms, Mollusks, Echinoderms and Coelentrates.

Brooks, W. K., <i>The Oyster</i> , (1905), Johns Hopkins Press....	1.00
Darwin, C., <i>Formation of Vegetable Mold through the Action of Worms, with Observations on Their Habits</i> , (1892), Appleton	1.50
Huxley, T. H., <i>The Crayfish: An Introduction to the Study of Zoology</i> , (International Science Ser.), (1895), Appleton..	1.75
Hyatt, A., <i>Commercial and Other Sponges</i> , (Guides for Science Teaching), (1893), Heath.....	.20

Vertebrates

Bailey, F. M., <i>Handbook of Birds of the Western United States</i> , (1902), Houghton	3.50
Blanchan, N., <i>Birds that Hunt and Are Hunted</i> , (1898), (N. Y.), Doubleday	2.00
Chapman, F. M., <i>Color Key to North American Birds</i> , (1903), Doubleday	2.50
Chapman, F. M., <i>Bird Life: A Guide to the Study of our Common Birds</i> , (1897), Appleton, Without colored plates....	1.75
With colored plates	5.00
Coward, T. A., <i>The Migration of Birds</i> , (1912), Cambridge University Press .....	.40
Dugmore, A. R., <i>Bird Homes</i> , (1900), Doubleday.....	2.00
Jordan, D. S., <i>A Guide to the Study of Fishes</i> , (1905), Holt..	12.00
Jordan, D. S., <i>Manual of the Vertebrates of the Northern United States</i> , (9th ed.), (1900), McClurg.....	2.50
Jordan, D. S., and Evermann, B. W., <i>American Food and Game Fishes</i> , (1902), Doubleday, Page.....	4.00
Lankester, E. R., <i>Extinct Animals</i> , (1905), Holt.....	1.75
Marshall, A. M., <i>The Frog</i> , (1912), Macmillan.....	1.10
Reed, C. A., <i>North American Birds' Eggs</i> , (1904), Doubleday	2.50

- Stone, W., and Cram, W. E., *American Animals*, (1902),
Doubleday\$ 3.00

Evolution and Heredity

- Crampton, H. E., *The Doctrine of Evolution*, (1911), Colum-
bia University Press 1.50
Darbishire, A. D., *Breeding and the Mendelian Discovery*,
(1912), Cassell 2.00
Darwin, Charles, *The Origin of Species*, Appleton..... 2.00
Darwin, Charles, *Animals and Plants under Domestication*,
Appleton 5.00
Doncaster, L., *Heredity in the Light of Recent Research*,
(1912), Cambridge University Press..... 1.00
Jordan, D. S., and Kellogg, V. L., *Evolution and Animal Life*,
(1907), Appleton 2.50
Kellicott, W. E., *The Social Direction of Human Evolution*,
(1911), Appleton 1.50
Punnett, R. C., *Mendelism*, (1911), Macmillan..... 1.25
Romanes, G. J., *Darwin and After Darwin: I. The Darwinian
Theory*, (1910), Open Court..... 4.00
Thomson, J. A., *Heredity*, (1908), Murray..... 3.50
Walter, H. E., *Genetics, An Introduction to the Study of
Heredity*, (1913), Macmillan 1.50

PHYSIOLOGY

ELEMENTARY TEXT AND REFERENCE BOOKS

- Budgett, *Essentials of Physiology*, Saunders..... 1.00
Colton, *Physiology, Experimental and Descriptive*, Heath.... 1.15
Eddy, *General Physiology and Anatomy*, American Book
Co. 1.20
Fitz, *Physiology and Hygiene*, Holt..... 1.12
Gulick Hygiene Series, Ginn
 I. Gulick, *Good Health*40
 II. Gulick, *Emergencies*40
 III. Jewett, *Town and City*..... .50
 IV. Jewett, *The Body at Work*..... .50
 V. Jewett, *Control of Body and Mind*..... .50
Hewes, *High School Physiology*, Am. Book Co..... 1.00
Hough and Sedgwick, *The Human Mechanism*, Ginn..... 2.00
Huxley, *Lessons in Elementary Physiology*, edited by Lee,
Macmillan 1.40
Jones and Stephens, *Outlines of Physiology*, (Phila.) Blak-
iston 1.50

Krohn, <i>Graded Lessons in Hygiene</i> , Appleton.....	\$.60
Martin, <i>The Human Body</i> , (Advanced course), Holt.....	2.50
Ritchie, <i>Human Physiology</i> , (Yonkers, N. Y.), World Book Co. ....	.80
Schenk and Güber, <i>Human Physiology</i> , tr. by Zoethout, Holt..	1.75
Walters, <i>Physiology and Hygiene</i> , Heath.....	1.20

LABORATORY GUIDES

Beddard, Edkins, Flack, Hill, MacLeod, and Pembrey, <i>Practical Physiology</i> , Longmans, Green.....	4.00
Gorham and Tower, <i>Dissection of the Cat</i> , Scribner.....	.90
Hawk, <i>Practical Physiological Chemistry</i> , (Phila.), Blakistons	2.50
Howell, <i>Dissection of the Dog</i> , Holt.....	1.00
Lombard, <i>Laboratory Work in Physiology</i> , (Ann Arbor, Mich.), Geo. Wahr	1.50
Stirling, <i>Outlines of Practical Physiology</i> , (Phila.), Blakiston	2.00

ADVANCED TEXTS AND REFERENCE BOOKS

Gerrish, <i>Text-book of Anatomy</i> , (Phila.) Lea Bros.....	6.50
Greene, <i>Kirke's Handbook of Physiology</i> (With Laboratory Outlines), (N. Y.) Wm. Wood	3.00
Hall, <i>Text-book of Physiology</i> , (Phila.) Lee Bros.....	4.00
Howell, <i>Text-book of Physiology</i> , Saunders.....	4.00
Hutchison, <i>Food and Dietetics</i> , Wm. Wood.....	3.00
Jackson, Morris' <i>Human Anatomy</i> , (Phila.), Blakiston.....	6.00
Schaefer, <i>Text-book of Physiology</i> , (2 Vols.), Macmillan....	15.00
Simon, <i>Physiological Chemistry</i> , Lee Bros.....	3.25
Sollman, <i>Text-book of Pharmacology</i> , Saunders.....	4.00
Stewart, <i>Manual of Physiology</i> (With Laboratory Outlines), Wm. Wood	4.00

PHYSICAL GEOGRAPHY

TEXT BOOKS

Davis, <i>Physical Geography</i> , Ginn.....	1.40
Dryer, <i>Physical Geography</i> , American Book Co.....	1.20
Emerson <i>Manual of Physical Geography</i> , Macmillan.....	1.40
Fairbanks, <i>Practical Physiography</i> , Allyn.....	1.60
Gilbert and Brigham, <i>Physical Geography</i> , Appleton.....	1.25
Salisbury, <i>Physiography</i> , Holt	3.50
Tarr, <i>Physical Geography</i> , Macmillan.....	1.00

GENERAL REFERENCE BOOKS

Brigham, <i>Elementary Geology</i> , Appleton	\$ 1.40
Chamberlain and Salisbury, <i>Geology</i> , (Vol. I), Holt.....	4.00
Davis, <i>Meteorology</i> , Ginn	2.50
Le Conte, <i>Geology</i> , Appleton	4.00
<i>Physiography of the U. S.</i> , American Book Co.....	1.50
Russell, <i>Glaciers of N. A.</i> , Ginn.....	1.75
Russell, <i>Lakes of N. A.</i> , Ginn.....	1.50
Russell, <i>Rivers of N. A.</i> , Putnam	2.00
Shaler, <i>Aspects of the Earth</i> , Scribner.....	2.50
Shaler, <i>Sea and Land</i> , Scribner.....	2.50
<i>Interpretation of Topographic Maps</i> , U. S. Geological Survey, Professional paper No. 60, (free).	
Waldo, <i>Elementary Meteorology</i> , American Book Co.....	1.50

AGRICULTURE

BOOKS THAT ARE ESSENTIAL

Bailey, <i>Fruit Growing</i> , Macmillan.....	1.50
Bailey, <i>Plant Breeding</i> , Macmillan	1.25
Bowman and Crossley, <i>Corn</i> , Bowman and Crossley, Ames, Iowa	2.00
Brigham, <i>Progressive Poultry Culture</i> , Torch Press.....	1.30
Burkett, <i>Soils</i> , Orange, Judd Co.....	1.00
Day, G. E., <i>Productive Swine Husbandry</i> , Lippincott.....	1.50
Henry, W. A., <i>Feeds and Feeding</i> , W. A. Henry, Madison, Wis.	2.25
Hunt, <i>Forage and Fibre Crops</i>	1.75
King, <i>The Soil</i> , Macmillan.....	1.50
Lyon and Fippin, <i>Principles of Soil Management</i> , Macmillan..	1.75
Mumford, <i>Beef Production</i> , H. W. Mumford, Urbana, Ill....	1.50
Plumb, <i>Types and Breeds of Farm Animals</i> , Ginn.....	2.00
Powell, <i>Co-operation in Agriculture</i> , Macmillan.....	1.50
Vivian, <i>First Principles of Soil Fertility</i> , Orange, Judd Co....	1.00
Warren, <i>Farm Management</i> , Macmillan	1.75
Wilson, <i>Evolution of a Country Community</i> , The Pilgrim Press	1.25
At least one good farm paper.....	1.00

BOOKS THAT ARE DESIRABLE, BUT NOT ABSOLUTELY
ESSENTIAL

FOR GENERAL USE

Bailey, <i>Cyclopedia of American Agriculture</i> (four volumes), Macmillan	\$ 20.00
Bailey, <i>Farm Buildings</i> , Sanders Pub. Co. (Chicago)	2.00
Bailey, <i>Insect Pests of Farm, Orchard and Garden</i> , Wiley....	3.00
Bailey, <i>Vegetable Gardening</i> , Macmillan	1.50
Davidson, <i>Agricultural Engineering</i> , Webb Publishing Co....	1.50
Osterhaut, <i>Experiments with Plants</i> , Macmillan.....	1.25
Roberts, <i>The Horse</i> , Macmillan.....	1.25
Smith, H. R., <i>Profitable Stock Feeding</i> , H. R. Smith, Anthony Park, Minn.	1.50
Voorhees, <i>Fertilizers</i> , Macmillan	1.25
Whitson and Woolster, <i>Soils and Soil Fertility</i> , Webb Publish- ing Co.	1.25

TEXT BOOKS

It is believed that better work will be done, if the teacher will use a number of good texts. If four or five copies of each of the following books are purchased, it will be unnecessary for the students to purchase any textbook.

Ferguson, <i>Elementary Principles of Agriculture</i> , Ferguson Publishing Co.	1.00
Goodrich, <i>First Book of Farming</i> , Doubleday, Page.....	1.00
Halligan, <i>The Fundamentals of Agriculture</i> , Heath.....	1.20
Jackson and Daugherty, <i>Agriculture</i> , Orange, Judd.....	1.50
Mayne and Hatch, <i>High School Agriculture</i> , American Book Co.	1.00
Warren, <i>Elements of Agriculture</i> , Macmillan.....	1.10

LABORATORY MANUALS

It will be necessary for each student to purchase a manual for his own use. The manuals named below are considered the best published and one of them should be adopted:

Call and Schafer, <i>A Laboratory Manual of Agriculture</i> , Mac- millan .....	.92
Eliff, J. D., <i>A Unit in Agriculture</i> , Row, Peterson.....	.50

DRAWING

BOOKS

Batchelder, E. A., <i>Principles of Design</i> , (1904), (Chicago), Inland Printer	\$ 3.00
Batchelder, E. A., <i>Design in Theory and Practice</i> , Macmillan	1.75
Brown, G. Baldwin, <i>The Fine Arts</i> , Scribner.....	1.25
De Garmo, <i>Art Appreciation</i> , (Syracuse, N. Y.) C. W. Bar- deen .....	.40
Dow, A. W., <i>Composition</i> , (N. Y.) (7th edition), Doubleday, Page & Co.	3.50
Duval, M., <i>Artistic Anatomy</i> , (N. Y.) Cassell.....	2.50
Edminster, C. F., <i>Architectural Drawing</i> , (N. Y.), Williams..	2.00
Froehlich, H. B., and Snow, B. E., <i>Art Education for High Schools</i> , (1908), (N. Y.) Prang.....	1.25
Holme, C., ed., <i>Modern Pen Drawing</i> , (N. Y.) Lane.....	4.00
Jackson, T. G., <i>Lessons in Decorative Design</i> , (Lond.) Chap- man	2.00
Johnston, Edward, <i>Writing, Illuminating and Lettering</i> , (Lon- don), John Hogg	2.12
La Farge, John, <i>Great Masters</i> , McClure, Phillips.....	2.50
Lilley, A. E. V., and Midgley, W., <i>Book of Studies in Plant Form</i> , Scribner	2.00
Longfellow, W. P. P., <i>Applied Perspective</i> , Houghton.....	3.00
Maginnis, C. D., <i>Pen Drawing</i> , (Bost.) Bates and Guild..	1.00
Miller, L. W., <i>Essentials of Perspective</i> , Scribner.....	1.50
Morris, I. H., <i>Geometrical Drawing for Art Students</i> , (Lond.) Longmans .....	.60
Mumford, J. K., <i>Oriental Rugs</i> , Scribner.....	7.50
Patridge, W. O., <i>Technique of Sculpture</i> , Ginn.....	1.00
Poore, Henry, <i>Pictorial Composition</i> , Baker, Taylor.....	1.50
Reinhardt, C. W., <i>Lettering for Draftsmen</i> , (N. Y.) Van Nos- trand	1.00
Reinach, Solomon, <i>Apollo or the Story of Art Throughout the Ages</i> , Scribner.....	1.50
Rimmer, C. H., <i>Animal Drawing</i> , Houghton.....	5.00
Robinson, <i>Principles of Architectural Composition</i> , Arch. Record Co.	2.50
Ross, D. W., <i>Theory of Pure Design</i> , Houghton.....	2.50
Ross, D. W., and others, <i>Illustrations of Balance and Rhythm</i> , (Bost.) Clarke	3.00
Spanton, J. H., <i>Complete Geometrical Course</i> , Macmillan....	1.25
Spanton, J. H., <i>Complete Perspective Course</i> , Macmillan.....	1.25

Townsend, W. G. P., <i>Plant and Floral Studies for Designers</i> , (N. Y.), Lane	\$ 2.00
Tracy, J. C., <i>Introductory Course in Mechanical Drawing</i> , American Book Co.	1.80
Western Drawing Teachers' Association, <i>Annual Reports</i> , (624 So. Grove Ave., Oak Park, Ill.) Ira Griffith.....	1.00
Woodbury, C. H., <i>Pencil Studies</i> , (Boston) Prang.....	1.50

PERIODICALS

<i>School Arts Book</i> (monthly), (Boston) School Arts Pub. Co., per year	1.50
<i>Arts and Progress</i> , (Washington, D. C.) American Federation of Arts	2.00
<i>The International Studio</i> (monthly), (N. Y.) John Lane, per year	5.00

MANUAL TRAINING

WOODWORKING

Crawshaw, F. D., <i>Problems in Furniture Making</i> , (Peoria, Ill.) Manual Arts Press	1.00
Goss, W. F. M., <i>Bench Work in Wood</i> , (Chicago) Ginn.....	.70
Griffith, Ira S., <i>Essentials of Woodworking</i> , (Peoria, Ill.) Manual Arts Press	1.00
Griffith, Ira S., <i>Correlated Courses in Woodwork and Mechanical Drawing</i> , (Peoria, Ill.), Manual Arts Press.....	1.00
Murray, M. W., <i>Problems in Woodworking</i> , (Peoria, Ill.) Manual Arts Press .....	.75
Noyes, William, <i>Handwork in Wood</i> , (Peoria, Ill.) Manual Arts Press	2.00
Park, J. C., <i>Educational Woodworking</i> , Macmillan.....	1.00
Ritchey, S. E., <i>Woodwork</i> , American Book Co.....	1.00

MECHANICAL DRAWING

Bennett, Charles A., <i>Problems in Mechanical Drawing</i> , (Peoria, Ill.) Manual Arts Press.....	1.00
Mathewson, Frank E., <i>Notes for Mechanical Drawing</i> , (Springfield, Mass.) Taylor-Holden Co.	1.25

PERIODICALS

<i>American Blacksmith</i> , Buffalo, N. Y.....	1.00
<i>Craftsman</i> , New York City.....	3.00
<i>Manual Training Magazine</i> , Peoria, Ill.....	1.50

<i>School Arts Book</i> , Worcester, Mass.....	\$ 1.50
<i>Wood Craft</i> , Cleveland, Ohio .....	.50
<i>Vocational Education</i> , Manual Arts Press, Peoria, Ill.....	1.50

HOUSEHOLD ARTS (DOMESTIC SCIENCE AND ART)

FOODS

BOOKS

Bailey, <i>Text-book of Sanitary and Applied Chemistry</i> , Macmillan	\$ 1.40
Chittenden, R. H., <i>Nutrition of Man</i> , Stokes.....	3.00
Conn, H. W., <i>Bacteria, Yeasts and Molds in the Home</i> , Ginn.	1.00
Dodd, <i>The Chemistry of the Household</i> , Amer. School of Home Ec.	1.50
Edgar, W. C., <i>The Story of the Grain of Wheat</i> , Appleton...	1.00
Farmer, Fannie Merritt, <i>Boston Cooking School Cook Book</i> , Little, Brown	2.00
Fletcher, Horace, <i>A B-Z of Our Own Nutrition</i> , Stokes.....	1.00
Green, <i>Food Products of the World</i> , Hotel World.....	1.50
Hill, Janet M., <i>Up to Date Waitress</i> , Little, Brown.....	1.50
Hough and Sedgwick, <i>Human Mechanism</i> , Ginn.....	2.40
Hutchison, Robt., M. D., <i>Food and the Principles of Dietetics</i> , Wm. Wood	3.00
Jordan, W. H., <i>The Principles of Human Nutrition</i> , Macmillan	1.75
Knight, <i>Food and its Functions</i> , Scribner.....	1.00
Leach, <i>Food Analysis and Inspection</i> , Wiley.....	7.50
Lincoln, Mary J., <i>Home Science Cook Book</i> , Whitcomb and Barrows	1.00
Parloa, <i>Home Economics</i> , Century	1.50
Pattee, <i>Diet in Disease</i> , A. F. Pattee.....	1.50
Ravenhill, Alice, <i>Practical Hygiene</i> , Whitcomb and Barrows..	1.50
Richards, <i>Cost of Cleanness</i> , Wiley.....	1.00
Richards, <i>Cost of Food</i> , Wiley.....	1.00
Richards, <i>Cost of Living, as Modified by Sanitary Science</i> , Wiley	1.00
Richards, <i>Cost of Shelter</i> , Wiley	1.00
Richards, <i>Handbook of Domestic Science and Household Arts</i> , Macmillan	1.00
Snyder, Harry, <i>Chemistry of Plant and Animal Life</i> , Macmillan	1.25
Snyder, <i>Human Foods</i> , Macmillan.....	1.25
Stiles, Percy, <i>Nutritional Physiology</i> , Saunders.....	1.25

White, Marion, <i>The Fuels of a Household</i> , Whitcomb and Barrows	\$.75
Williams and Fisher, <i>Elements of the Theory and Practice of Cookery</i> , Macmillan	1.00

BULLETINS

The following Farmers' Bulletins, issued *free* by the United States Department of Agriculture, Washington, D. C., are valuable:

- No. 25. *Peanut Culture and Uses.*
- No. 29. *Souring of Milk.*
- No. 34. *Composition and Cooking of Meat.*
- No. 36. *Cotton Seed and Its Products.*
- No. 42. *Facts about Milk.*
- No. 62. *Pure Cultures of Bacteria for Cheese Making.*
- No. 63. *Care of Milk on the Farm.*
- No. 73. *Pure Water; Cooking Vegetables.*
- No. 84. *Potatoes as Food.*
- No. 85. *Fish as Food.*
- No. 87. *Food Value of Eggs.*
- No. 93. *Sugar as Food.*
- No. 103. *Preserving Eggs.*
- No. 105. *Cereal Breakfast Food.*
- No. 112. *Bread and Bread Making.*
- No. 114. *Skim Milk in Bread Making.*
- No. 119. *Banana Flour.*
- No. 121. *Beans, Peas and Other Legumes as Foods.*
- No. 122. *Selling Eggs by Weight; Flavor of Eggs; Nuts as Food; Coffee Substitutes.*
- No. 124. *Distilling Drinking Water.*
- No. 131. *Household Tests for the Detection of Oleomargarine and Renovated Butter.*
- No. 135. *Sorghum Syrup Manufacture.*
- No. 144. *Curing Cheese.*
- No. 162. *Cooking of Meat.*
- No. 166. *Cheese Making on the Farm.*
- No. 169. *Food Value of Beans.*
- No. 175. *Home Manufacture and Use of Unfermented Grape Juice.*
- No. 183. *Meat on the Farm, Butchering, Curing, Keeping.*
- No. 186. *Curing Cheese in Cold Storage, Keeping Quality of Butter.*
- No. 190. *Cost of Eggs in Winter.*
- No. 193. *Bread and Toast; Cooking Meat.*
- No. 202. *Manufacture of Cottage Cheese.*

- No. 203. *Canning of Fruits, Preserves and Jellies.*
 No. 237. *Cereal Breakfast Foods; Swiss Cheese.*
 No. 241. *Butter Making on the Farm.*
 No. 244. *Cooking Quality of Potatoes; Food Value of Cottage Cheese.*
 No. 249. *Cereal Breakfast Foods.*
 No. 256. *Preparation of Vegetables for the Table.*
 No. 262. *Water for Table Use.*
 No. 281. *Corn as Food for Man.*
 No. 295. *Potatoes and other Root Crops as Food.*
 No. 298. *The Fireless Cooker; Food Value of Corn and Corn Products.*
 No. 305. *Gluten Flours.*
 No. 309. *Ice for Household Use.*
 No. 316. *Cooking Cereal Foods.*
 No. 326. *Macaroni Wheat.*
 No. 329. *Cane Sugar and Beet Sugar.*
 No. 332. *Nuts and Their Uses as Food.*
 No. 342. *Cooking Beans and other Vegetables in the Home.*
 No. 348. *Bacteria in Milk.*
 No. 353. *The Ice Box.*
 No. 363. *Use of Milk as Food.*
 No. 374. *Flour for Baking Powder Biscuits.*
 No. 384. *Whipped Cream.*
 No. 388. *Jelly and Jelly Making.*
 No. 389. *Bread and Bread Making.*
 No. 391. *Economical Uses of Meat in the Home.*
 No. 412. *Milling and Baking Tests with Durum Wheat.*
 No. 413. *The Care of Milk and its Uses in the Home.*
 No. 535. *Sugar and its Value as Food.*

TEXTILES AND CLOTHING

BOOKS

Carpenter, <i>How the World is Clothed</i> , American Book Co.	\$.60
Chamberlain, <i>How We are Clothed</i> , Macmillan . . . . .	.40
Dooley, W. H., <i>Textiles</i> , Heath	1.00
Gibbs, Charlotte, M., <i>Household Textiles</i> , Whitcomb and Barrows	1.25
Harman, William, <i>Textiles Fibres of Commerce</i> , Chas. Griffin & Co., London	3.00
Matthews, J. M., <i>Textile Fibres</i> , Wiley	4.00
Woolman, M. S., <i>A Sewing Course for Teachers</i> , Seiler	1.50

BULLETINS

The following Farmers' Bulletins, issued *free* by the United States Department of Agriculture, Washington, D. C., are valuable:

No. 27. *Flax from Seed to Fiber.*

No. 69. *Flax Culture.*

No. 137. *Angora Goat.*

No. 165. *Silk Worm Culture.*

No. 274. *Flax Culture.*

No. 302. *Sea Island Cotton.*

Other valuable bulletins, issued *free*, are as follows:

Office of Experiment Station, Washington, D. C.

No. 33. *The Cotton Plant; History, Botany, Characteristics, Culture and Uses.*

Office of Fiber Investigation, Washington, D. C.

Report, No. 4. *Flax Culture in Ireland, Belgium, Austria, Russia.*

Report, No. 106. *Flax for Seed and Fiber.*

MISCELLANEOUS

Brown, <i>Baby, a Book for Mothers and Nurses</i> , Whitcomb and Barrows	\$ 1.00
Clark, T. M., <i>Care of a House</i> , Macmillan.....	1.50
Cooley, <i>Domestic Art in Woman's Education</i> , Scribner.....	1.25
Daniels, Fred H., <i>Furnishing a Modest Home</i> , Atkinson.....	1.50
Egbert, <i>Manual of Hygiene and Sanitation</i> , Lea.....	2.25
Hough and Sedgwick, <i>Elements of Physiology</i> , Ginn.....	2.00
Mason, O. T., <i>Woman's Share in Primitive Culture</i> , Appleton	1.75
Richards, Ellen H., <i>Cost of Cleanness</i> , Wiley.....	1.00
Richards, <i>Cost of Food</i> , Wiley.....	1.00
Richards, <i>Cost of Shelter</i> , Wiley.....	1.00
Talbot, Marion, <i>The Education of Women</i> , University of Chicago Press	1.25
Vail, <i>Approved Methods of Home Laundering</i> , Proctor and Gamble, Cincinnati	free

The following books, issued by the American School of Home Economics, Chicago, are valuable:

<i>The House</i>	\$ 1.50
<i>Household Bacteriology</i>	1.50
<i>Household Hygiene</i>	1.50
<i>Chemistry of the Household</i>	1.25
<i>Household Management</i>	1.25
<i>Personal Hygiene</i>	1.50
<i>Home Care of the Sick</i>	1.50
<i>Textiles and Clothing</i>	1.50
<i>Study of Child Life</i>	1.50
<i>Care of Children</i>	1.25

ECONOMICS

For references in General Economics, see page 54. To that might be added:

Bullock, <i>Select Readings in Economics</i> , Ginn.....	2.25
Fetter, <i>Principles of Economics</i> , Century Co.....	2.00
Seligman, <i>Principles of Economics</i> , Longmans.....	2.50

COMMERCIAL GEOGRAPHY

Adams, <i>Commercial Geography</i> , Appleton.....	1.10
Davis, <i>Physical Geography</i> , Ginn.....	1.25
Gregory, Kellar and Bishop, <i>Physical and Commercial Geography</i> , Ginn	3.00
Trotter, <i>Geography of Commerce</i> , Macmillan.....	1.10

TEACHER-TRAINING COURSES

For library equipment for teacher-training courses, see syllabus issued by State Superintendent of Public Schools, Jefferson City, Missouri.

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